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The Magazine of New Energy Science and Technology

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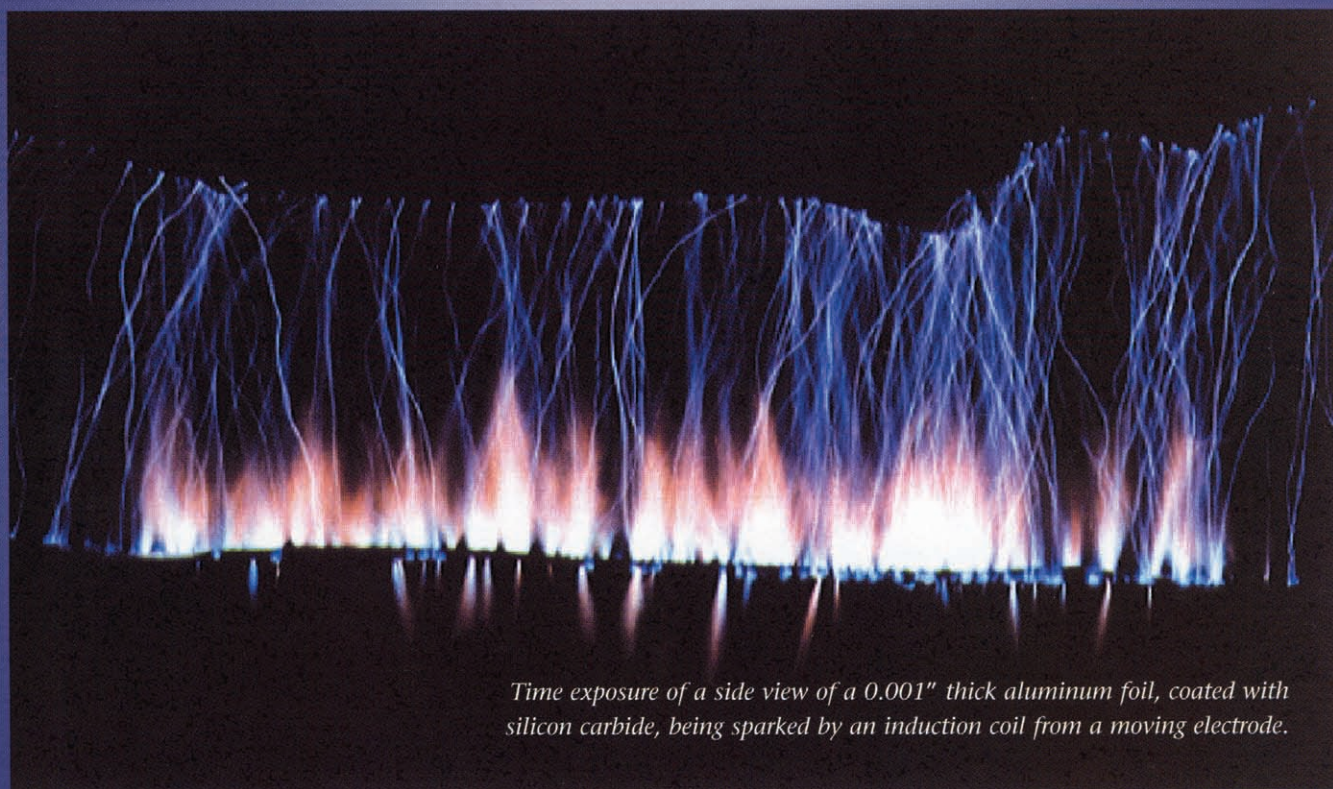


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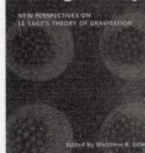


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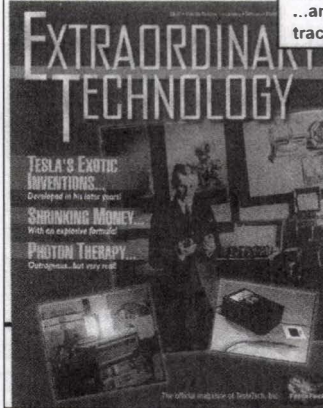
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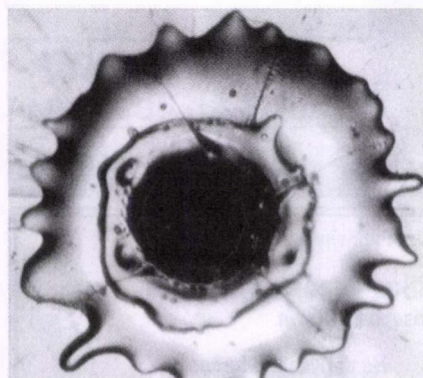
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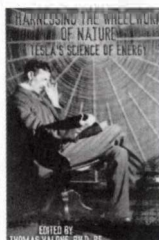
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## LETTERS TO THE EDITOR

### IE Wrong About SR?

Because you have done so much for cold fusion for so long, I will subscribe to *IE* forever. But you are so wrong about Special Relativity and Dr. Einstein in an age of legitimate theory scandal (cold nuclear fusion exposes the missing causal substratum, a reference from Dr. Einstein); it's embarrassing to the empirical realness of cold fusion.

Special Relativity: 1) the laws of physics are the same in all inertial systems, 2) the speed of light in free space, measured in all inertial systems, is a universal constant  $c$ .

When Postulate 2 is translated into math, it links two inertial frames of reference using two algebraic equations with unknown coefficients. The common solution of these two equations which, according to the rules of math, merely restates the original premise/equations, produces the Lorentz factor. Thus, the derivation Lorentz factor equations, which are always reciprocal, are merely a mathematical restatement of the second postulate. The full Lorentz transformation equations (often ignored, *e.g.*, in QM which is not Lorentz covariant), which are only reciprocal for equal energy systems, then follow from Postulate 1.

In order to disprove the Special Theory of Relativity one merely has to disprove one of the postulates. This occurs if one finds a special inertial frame of reference for physical laws/measurements or measures any non- $c$  (also inertial) value for the speed of light. Otherwise, the simplicity is amazing.

I stipulate that the applications are widely mistaught and misinterpreted, as your SR articles attest. I also stipulate that there is a presently inexplicable conflict between the nature of a substance light and the nature of a substance or property mass, which conflict is the source of some theoretical animus.

Thank goodness the centennial will end soon.

John Neergaard  
Foxworth, Mississippi

**Editor William Cantrell Replies:** If simplicity is to be equated with beauty, then simplicity is definitely in the eye of the beholder. Many erudite researchers disagree with the validity, not to mention the simplicity, of relativity theory. Starting first and foremost with the Lorentz transformation equations—they are not Galilean-invariant and they are not even Lorentz-invariant. They are Lorentz co-variant, which causes the non-physical entanglement of length and time measurement. Of course, the magic doesn't end there. . . Newton's Third Law is violated, which gives rise to phantom rotations of coordinate systems, and the final insult, simultaneity of events is sacrificed—all this to *force* the speed of light to be constant with respect to all observers, no matter if they are moving at  $0.00001c$  or  $0.9999c$ .

Prior to the revelations by Galileo, the infallible *expert* on the subject of physics was none other than Aristotle, who taught us that the laws of nature could be divined solely by using the human intellect, and that actual experimentation

was something akin to menial labor. Although Aristotle was only dimly aware of the physics of his day, this didn't stop him from performing thought experiments to confidently and enthusiastically inform us that heavier bodies fall faster than lighter ones, and that men have more teeth than women. Fortunately for us, a few pesky mavericks decided to ignore his Authority and carry out the actual experiments. But in the interim, Aristotle's teachings stalled the progress of science by some 600 years. Just imagine where we might be today if this roadblock had not occurred!

I have a radical suggestion—and there is no chance of it being carried out—so let's just consider it a *Gedanken* suggestion. At the undergraduate level, teach *all* competing theories that are consistent with the experimental evidence regarding light-speed behavior. Let the *student* decide which theory is most plausible. I'd wager that if this were actually done in our Institutions of Higher Learning, relativity theory would be dead within a generation.

I have another radical suggestion—perform some of the physical experiments<sup>1</sup> that *can* decide between relativity theory and other competing theories, now that technology has progressed to the point where at least some experiments can actually be performed. For staunch relativists, it is the ideal opportunity to knock down the competition, so what is there to fear?

Making a prediction is always risky, but the powerful drive of free enterprise should not be underestimated. I predict that profitable and blatantly *non-relativistic* engineering applications<sup>2</sup> of the GPS constellation (applications expressly *forbidden* by relativity theory) will be implemented in the near future, as described by Wang, Hatch and others.

The GPS data indicates that the speed of light is *not* constant with respect to the observer—that it is constant with respect to the Earth Centered Inertial (ECI) non-rotating reference frame, at least in the vicinity of the Earth's gravitational field, and farther out, the solar system's barycentric reference frame.<sup>3</sup> Yes, thank goodness the centennial will indeed end soon.

1. Wang, R. and Hatch, R.R. 2002, "Conducting a Crucial Experiment of the Constancy of the Speed of Light Using GPS," *Proc. of the ION 58th Annual Meeting and the CIGTF 21st Guidance Test Symposium*, 495-505, June 24-26, 2002, Albuquerque, NM.

2. Wang, R., 2000. *Proc. of the IAIN World Congress in Assoc. with the U.S. ION 56th Annual Meeting*, 90-99, San Diego, CA.

3. Renshaw, C. 1999. "Explanation of the Anomalous Doppler Observations in Pioneer 10 & 11," *Proc. IEEE Aerospace Conf.*, 2, 59-63.



### Too Little LENR Coverage

I am wondering why there is so little in the way of new research on the LENR field in Issue 60 of *IE*. Kindly let the regular press soft pedal the reality of our imminent crisis.

It is worth bearing in mind that the marketplace is a terrible predictor of future supply or future demand of any-



thing. If it were, the price of oil would have gone up much more a long time ago. Think about it, the price of gas has almost doubled in the last four years. It will no doubt double again in the next four years. (I think we all already know this and have accepted it in the back of our minds.) Maybe then the regular press will start to seriously look at what we will be facing and the need to have made big investments in research in the past.

They will also wonder if any publication has been looking at ambitious alternatives. I hope they will find that *Infinite Energy* is considered the benchmark of such publications.

Christian Ismert  
Shawnee Mission, Kansas



### Top-Down Science

Issue 58 of *Infinite Energy* was thought provoking with regard to the theory of everything, the pursuit of which perpetually challenges science and religion. I offer the following commentary that references various spiritual texts, ancient and contemporary.

Religions of the world, major and minor, teach that certain individuals possessed divine consciousness. They purport that these individuals knew the creator, his purpose and intent of mankind and creation. While religions passionately argue over which individuals were truly divine, they are consistent in declaring that God took human form, walked the Earth, and taught about spirituality. This commentary seeks not to weight the merits of any of the particular individuals, but to observe the commonalities in their creation stories.

Creation stories broadly share three things in common: They describe, 1) an origin from nothingness, 2) a spiritual current emanating from nothingness with many sub-currents that sustain creation on a vibratory polarity principle, and 3) humans who have divine consciousness who speak and write about spiritual matters.

Norse Mythology describes the origin as follows: "in the beginning there was the void called Ginnungagap. Along with the void existed Niflheim the land of fog and ice in the north and Muspelheim the land of fire in the south. . ."

The ancient Egyptian *Book of Knowing: The Evolutions of Ra* describes as follows: ". . . I am the creator of everything which came into being. . . The sky (or heaven) had not come into being, the earth did not exist, and the children of the earth, and the creeping, things, had not been made at that time. I myself raised them up from out of Nu, from a state of helpless inertness."

The *Denkard* is a ninth century encyclopedia of ancient Zoroastrian texts. In Book 4:3 it is written: "Be it known that the One God is the cause of the beginning (of creation) and is the causer of causes. Cause is not for Him. (i.e. He is uncaused.)"

The *Tao Te Ching*, by Lao Tsu of China, describes the Originator as follows:

Ch.1.1. The Tao that can be trodden is not the enduring and unchanging Tao. The name that can be named is not the enduring and unchanging name.

2. (Conceived of as) having no name, it is the Originator of heaven and earth; (conceived of as) having a name, it is the mother of all things. . .

To understand "the Always-So," is to be illuminated. . .

The term "Always-So" is interpreted as unchanging, unchangeable, and everlasting and is comparable to infinite.

In 1945, two farmers discovered early Christian documents, designated as Nag Hammadi texts, that were hidden in a jar on the bank of the Nile River. From the Gospel of John, Chapter 2:1

It is illimitable as nothing is before it to limit it. It is unfathomable, since there is nothing before it to fathom it. It is immeasurable, since there was nothing before it to measure it. It is unobservable, since nothing has observed it. It is eternal, and exists eternally. . .

Bulleh Shah was an eighteenth century Sufi Muslim, and eminent scholar of Arabic and Persian. He was a poet of spiritual literature. In his *Story of Creation* he writes:

When the One existed all alone. No light of His was manifest. Nor did God or His prophets exist. . . He was without a peer, without an equal, He was without a form, without a second. He was without a color, without a design. . .

From the Bible, Genesis 1:1-3 it is written: "In the beginning God created the heaven and the earth. And the earth was without form, and void; and darkness was upon the face of the deep. . ."

The fifteenth century Sikh Guru Nanak wrote the poem, "The Absolute Lord":

Unknowable is my Lord, without end;  
Unfathomable is He, beyond description. . .  
He has no form, no color, no line. . .  
He is endless, He is infinite. . .

Seth Shiv Dyal Singh, known as Swami Ji of Agra, India, in the nineteenth century initiated a spiritual movement known as Sant Mat (true path). In his text "Sar Bachan" (revealed words), Swami Ji describes a nothingness from which the creator takes the form of a spiritual current that creates and sustains all of creation.

Logic tells us that we cannot create something out of nothing so we are left to explain the relationship between the finite and the infinite. The Yin-Yang symbol offers us a conceptual clue. A symmetrical "S" shape divides a circle. The circle still exists as a whole, yet its subdivision created two internal counter-balancing forms. This is an expression of the polarity principle by which oneness and the duality co-exist.

The Sant Mat creation story is highly specific. It defines a vibratory current that branches to three sub-currents. These three currents correspond to the positive, negative, and neutral forces and to the creative, sustaining, and destructive forces of life cycles. They create and sustain three realms—the Causal, the Astral, and the Physical—wherein the actions of birth, life, and death take place.

The Norse Yggdrasill Tree describes eleven currents with three primary currents. Similarly, the Greek and Jewish Kabbalas define a Tree of Life with eleven energy centers called Sephiroths. From the Crown the current split into three branches. The Vedic system has the Brahmical Tree with three current emanating from Brahm.

In Zoroastrian literature, the term Asha, for which Fire is used as a symbol, is taken to mean the "original light of



God," translated as Truth, righteousness, or holiness. The terms Atash Bahram, Atash Adaran, and Atash Dadgah refer to the highest or (victorious fire), middle, and lowest grades of consecrated fire or resolutions of light and truth.

In the Sikh and Sant Mat literature, Kal is the counterpart to Brahm of the Vedic system. Kal literally means time or death as the creation is subject to actions and states of existence that have beginnings and ends. In the Abrahamic religions of Judaism, Christianity, Islam, and the more contemporary Bahai World Faith the deity Satan relates to Brahm and Kal as the negative power. Zoroastrianism speaks of Angra Mainyu as the negative power as opposed to God the positive eternal power.

The Sikh and Sant Mat literature defines this branching nexus center as Trikuti, meaning three prominences. Islamic literature uses the name Musallasi, meaning three corners. The patriarch of the Abrahamic religions was Abraham formerly called Abram. The name Abram may have derived from the word abrahm whereas "a" before brahm denotes "without the quality of." For Abraham to be at oneness with the creator he would be abrahmic. Similarly, akal means not subject to time or death as not subject to life cycles, hence eternal.

The Kabbalistic system is comprised of two positive polarized currents and two negative polarized currents, the "Yod He" above, and the "Vau He" below. The creation of energy fields of elements are called Tattwas in the Vedas. The ancient Chinese called it the "Yang" or active male principle above, and the "Yin" or negative female principle below. Niflheim of the Norse Mythology describes a polarized realm of fire and ice.

The ancient Greeks applied dual polarity concepts of health linked to cosmology. They considered that an invisible element known as the Prima Materia, or Aether, which permeated all space, was considered to be the foundation substance of the four basic elements; Earth, Water, Air, and Fire. The entire material world, including the health of mankind, was considered to evolve around the balance of the first four material elements. Aether was considered to represent the realm of invisible and spiritual forces in man and the universe.

Dr. Julian Johnson, a follower of Sant Mat teachings and author of *Path of the Masters*, writes:

That which physical science calls energy, which in Sanskrit is call prana, is only a manifestation of this life stream, "stepped down" to meet material conditions. . .It has many forms of expression, most of which are not yet known to physical science. . .every force known, from primal energy called prana down to electricity and magnetism, are all modified forms of the same eternal current. . .

Another Sant Mat author, Lekh Raj Puri, writes in his book *Mysticism: The Spiritual Path*, Vol. 1:

. . .the Vedas mention "Om" or Brahm as "Hiranya Garbha"; "Hiranya Garbha" means one who has gold inside (in the womb) and this is said of Brahm (God). The reference here is to the transcendent Light of the spiritual stage of Brahm, which shines like the colour of gold, and which is the "womb" of God. "Golden Egg." It is a womb, because all the lower creation of

the astral and physical planes originates and emanates from this place, just as a child is made in the womb. The germ or seed of all creation is there, and is this is truly the womb of God.

Similarly, the Nag Hammadi text of St. John defines Barbelo as the universal womb.

The relationship between these finer and coarser realities may be conceptualized by considering a simple tapestry wherein we can define three levels of resolution. Fibers are twisted into yarn and yarn is woven into fabric so we can discuss fibers, yarn, and fabric at differing levels of resolution. We can say that fiber is the fundamental reality of yarn and that yarn has taken the form of a fabric. If the fiber were to disintegrate, the yarn and the fabric would disintegrate, whereas the fabric could come unwoven without changing the condition of the fiber or the yarn.

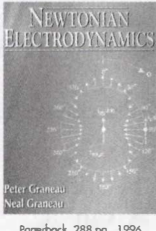
Within the fabric we can define three sets of coordinates. The fabric can lay on an X-Y table, but if we are to examine the yarn, its coordinates will follow a cyclic path through the weave. The coordinates of the fibers will follow a path that twists and bends as it conforms to the yarn's cyclic path. By this analogy, we can define nine dimensions of space within the fabric.

Physical science relies heavily on phenomenon being made visible because we are largely dependent upon our five senses for learning. We accept, for instance, that media broadcasts emit waves that are received to produce audible sounds and visible images because we see and hear the results through devices. Yet many struggle with accepting that thoughts and emotions are broadcast through a medium of much finer resolution. Our scientific thinking has been prejudiced against that which we cannot readily make visible via reliable technology. Ironically, in daily life, what we accept as reality is largely the densest form of existence, namely solid objects.

Newton theorized gravity after observing an apple falling from a tree. He could not see gravity, but he could see the apple and by measuring its movement he could mathematically formulate gravitational force. Yet today, gravity remains largely undefined as a force.

We are essentially groping in the dark in a skeptical bottom-up process of discovery. As we delve further beyond the boundaries of that which is readily measurable, it may be useful to look for intuitive clues in the writing of those exceptional humans who are believed to have had divine consciousness.

Sam Kjellman  
Henniker, New Hampshire



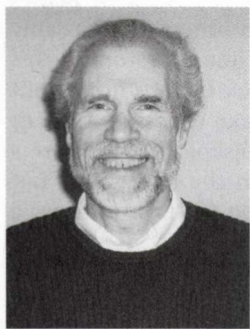
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## Charge Clusters: The Work of Ken Shoulders

William Zebuhr

Our cover article in this issue is about charge clusters, which are compact groups of electrons. They defy the common belief that such things cannot occur because of the great repelling forces these electrons should exert on each other. Yet they do appear to exist and are not even that difficult to create, once you know how. Ken Shoulders knows how and has been doing it for about 25 years. Ken and his son Steve experiment with charge clusters (also called exotic vacuum objects or EVOs) in a well-equipped, privately funded lab in California. Ken has a history of working at the edge of science and engineering. He worked at SRI International for ten years as a staff scientist and started a field now called vacuum nanoelectronics, which is based on field emission active devices. He also worked at MIT (during this time he fabricated the world's first microcircuits) and later did some exotic and confidential work for the CIA and others.

Ken's very qualified background has helped convince many people that the EVO phenomenon is real, in spite of the difficulty in believing that electrons can form such clusters. Ken notes: "Nobody believed anything ever said. They only believed the gadgets that were run by EVs. I actually had to almost beat the patent office into submission by a series of brutal assaults with my devices!"

Not only are the clusters themselves exotic to mainstream science but they seem to offer a way of connecting to the most fundamental and universal element of existence, sometimes called the aether. Ken refers to this as the Potentium, a name given by Joe Firmage. Whatever the name, it is a little understood part of the universe that many agree is loaded with energy if we only knew how to tap into it. The EVO may be the fundamental connecting link. Ken considers it a "kind of Universal Clutch as it clutches the basic fabric of the universe by biasing the medium with a dense, asymmetrical charge distribution." This is a very powerful concept and may well be the foundation of any device that operates with an "efficiency" over-unity.

This clutch apparently can operate in many environments. EVOs are likely the source of the extremely high temperatures recently measured in collapsing bubbles formed by cavitation. Temperatures as high as 20,000 degrees K have been measured (see p. 37). Temperatures in this range need an exotic explanation and EVOs exhibit extremely high temperatures. Sonofusion is likely triggered by the same mechanism and may not really qualify as "cold" fusion. The

destructive effects of cavitation on marine propellers has been known for over 150 years but never explained satisfactorily. Likewise the cavitation that can occur in pumps. There have been many claims of over-unity performance in pumps designed to produce a lot of cavitation but never enough to be useful as an energy source because the input is electrical and the output is heat at moderate temperatures.

Tesla is known to have been able to create what appeared to be ball lightning and even was able to let it touch him without harm. Ball lightning is probably a large charge cluster. It is not well understood but can appear in lightning storms, coming and going in mysterious ways, sometimes quietly and sometimes with a great deal of commotion. Understanding charged clusters better may clarify some of Tesla's work as well as give a better understanding of a strange natural phenomenon.

I have mentioned before that it may take decades from now to market a useful over-unity or "free energy" device. I based that on the work that Ken and others are doing in the cutting edge of this science. Ken has been working on this problem for 25 years and cold fusion/LENR work has been going on for over 15 years. This is difficult work that requires a rare combination of creativity, persistence, energy, and attention to fine detail. It also often involves the ability to improvise because of lack of funding and all too often a thick skin to put up with the unimaginative naysayers. On top of all this the work can also be dangerous. EVOs contain incredible potential energy for their size and it is not difficult to make them big enough to blow up a lab or more.

The work to date is much more science than engineering though doing the science often involves considerable engineering. This is quite different from the engineering that goes into an energy machine that could be sold to the public as an appliance or to a utility as a generator. We are still a long way from that. Fundamental understanding needs to progress to the point where results are consistent, reliable, safe, and can be had at reasonable expense. Only then can a product be engineered around the concept. This will take many years and many dollars.

One of the most difficult problems in the new energy field is funding for good ideas. This is because of the very long time to market by conventional investment standards and because of the great difficulty of evaluation of the potential of the technology. A significant part of the evaluation problem is caused by the fact that most new energy concepts are



either pure bunk or just on the wrong path. The very encouraging part of what Ken and Steve are doing is that, 1) they have great credentials for understanding this work, 2) the experimental techniques are very good and the associated theory is sound, and 3) the potential payoff of this approach is huge. This technology has the potential of being engineered into a very powerful, compact, and economical machine with endless variations and applications. There is still the problem of time to market.

Investors who are inclined to take this kind of risk like to see the potential of making 30 or 40% annual returns. This is not only because they want to make a killing but because so many ventures fail that each winner must support several complete losses. This means that even if an idea looks like it will be worth \$1 billion when developed it may not be worth enough to an investor to put the required money in during the early phases of development. It is very realistic that a given idea from concept to product could take 20 years. If it is worth \$1 billion in 20 years it is now worth only \$5.2 million discounted at 30% and only \$1.2 million discounted at 40%. Since it will often take more than this to even get traction with the idea, it is clear that even if the inventor sells his whole idea to the investor he will not have enough money to do the work. Actual cases are probably much worse than this. The project will take longer, cost more, and may even have competition problems when it is finally on the market.

Ken has mostly self-funded his work to date and the potential is so big that there ought to be a good investment opportunity in the work, but the time to market is still unknown and the real cost of development is unknown. This means the investor would still have to have a very long-range vision and deep pockets. These are hard to find. More conventional technology gets funding in the many established ways, including private investors, venture capital, corporations, and governments. These avenues are rarely open to risky and long-range projects. Many historic inventors, such as the Wright brothers, funded their own work for the same reasons but technology has gotten orders of magnitude more complex in the last 100 years and this method is only open to the truly wealthy today.

The new energy field needs more people willing to give grants to promising ideas with minimal strings attached. Many foundations exist for endless causes, few of which come close to offering the result that some of the good ideas in the field offer.

Foundations don't invest because they hardly even know the new energy field exists and they have no way of evaluating ideas even if they learn about them. There are very few people qualified to evaluate this technology. Even if they are very knowledgeable in the general field it is very difficult to make judgments of work done by others without spending a lot of time with the innovator. This is expensive and often the innovator is reluctant to expose critical parts of the technology. Furthermore, a hired consultant is usually correct if he declares that there will be a lot of problems and recommends against investment.

A new energy peer review process involving a credible group of scientist and engineers would be very helpful in selecting the best technology for funding but this won't happen soon. The whole nature of the field is against it. Many are innovative in their own project but not interested in oth-

ers. There are theories and there are experimental results that may or may not be facts and the two often don't agree. These problems are not necessarily anyone's fault. It is a logical result of a few people trying to solve huge problems using a science they don't understand yet. A lot of planes crashed before (and after) the Wright brothers for the same reasons. The net result is that at this time investors in this field must be willing to take large risks. Even a non-profit foundation or private donor cannot take excessive risks or their money and credibility will soon disappear. There are a few generous and thoughtful donors in the field today but much more is needed to generate some traction and get a useful device out in the market.

*Infinite Energy's* founding editor, the late Gene Mallove, was an advocate of taking even a very simple device into the market—even if it was just a toy—to generate interest and publicity. This is still a good idea but even that modest goal is very elusive. I have lost track of the number of "magnetic" motors that people have gotten excited about but have never heard a credible story about one that actually worked. A concentrated effort is needed on a chosen technology to achieve Gene's goal. The EVO technology has promise of yielding very exciting results with a fairly modest amount of funding.

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(Received March-April 2005)

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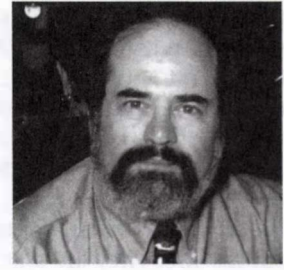
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William Zebuhr, Chairman  
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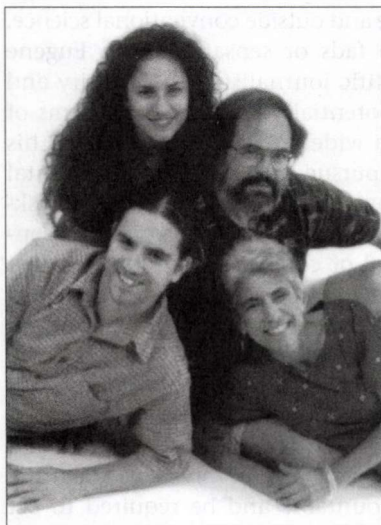
# The Longest Year: Mourning the Loss of Eugene Mallove



*At this time, the one year anniversary of the senseless murder of our founder and editor, Dr. Eugene Mallove, Infinite Energy would like to share the words of Gene's family. Our organization has grieved with Gene's family and his countless friends around the world since his death on May 14, 2004. The New Energy Foundation is striving to indefinitely maintain the publication of Infinite Energy and to secure more funding for new energy researchers. The journey has been difficult without Gene at the helm, but we are continually encouraged by Gene's enduring spirit. Following the family commentary is a tribute written by Scott Chubb and Tom Valone. Visit the family's tribute site at [www.eugenemallove.org](http://www.eugenemallove.org).*

It has been almost a year as I write this and yet it seems like a lifetime. Not a day has gone by since my dad was killed that I haven't thought of him, what his life means to me, and how to move forward despite his unbearable absence.

The lack of an arrest(s) for his brutal murder at this point only deepens the sadness because it's a constant reminder of the grim possibility that the perpetrator(s) will get away with this heinous crime. Someone took the life of the most warm-hearted, generous, intelligent, and fun-loving person I knew.



The Mallove family in 2000.

I recently had enough courage to watch a video of the last time I saw my dad. It was his visit to meet his grandson, when he was one week old. I felt like I could reach out to him; his proud smile beamed, his silly commentary made me laugh throughout, so full of life, but no longer.

My thoughts each day must still remind me he is no longer living, that someone robbed me of a father just as I was becoming a parent myself. They robbed my mom of her life partner, the person she spent more of her life *with* than without. The hole in my heart will never be patched. My innocence has been stolen, our family shattered, memories tainted. Our lives will never be as they were.

—Kimberlyn Woodard—

Never could I have imagined how little I knew about the word "despair" before my father was murdered.

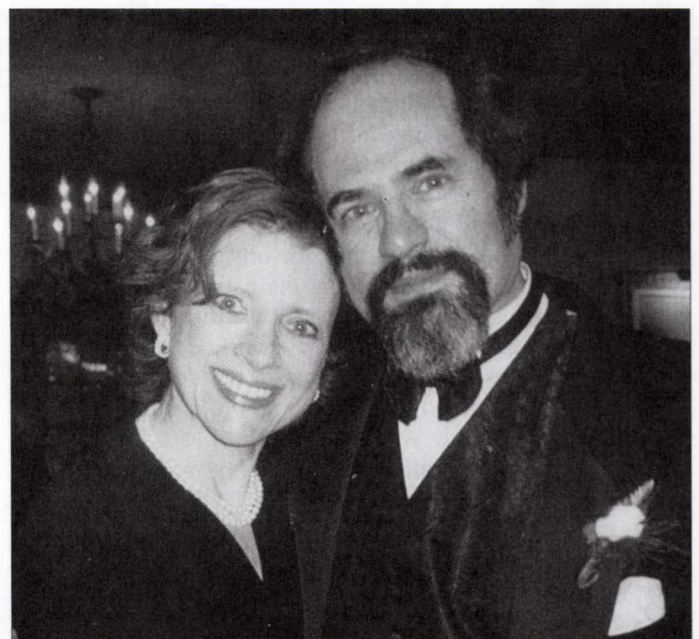
There are constant reminders surrounding me of how much he loved and cherished life—Chinese restaurants,

country music, post offices, pugs. . . In so many ways, it's hardly believable the nightmarish incident actually happened. His clothes and cowboy hat are still in his closet. As if he just stepped out to do an errand, his office appears just as he left it, with a parking space still empty for his green Dodge Caravan.

While the case remains unsolved, the perpetually reverberating echo chamber of "who? why? who? why?" is unimaginably loathsome, and I find myself absorbed mostly by a strange amalgam of horror, rage, and confusion.

—Ethan Mallove—

Words cannot express the pain and sadness my family has endured this past year because of the loss of my beloved cousin, Eugene. As Gene would say, "A tragedy of epic proportions." For the first few months after his death I didn't know if I could even live through the pain that I was



Gene with his cousin Jana, at Kim's wedding in 1998.



feeling. It was heartbreaking! I was stumbling around, mumbling Shakespeare, "To be or not to be, that is the question," because I wasn't sure I could be without Gene.

Much to my own surprise, I am much better now. I have pretty much accepted what happened, and I know I can't change it. I am left with this incredible sorrow, even though time does have a way of tempering even the most difficult of losses.

I am grateful to have Joanne, her children and grand children in my life. They are a little piece of Gene, and they are truly the main reason I have gotten a little better. It is through comforting each other that we have all been able to

get through the grieving process. One step at a time.

I am as sure as the stars above that Gene is with us and is watching over us, especially delighting in the growth of his two precious grandsons, Matthew Grant Woodard (1 year old) and Julian Gene Mallove (6 months old).

I know Eugene always had the courage to take "the road less traveled" when it came to his professional life and I also know, with all my heart, that his dreams and hard work will not be in vain. One day we will all live the reality of an infinite energy world.

—Jana Scher—

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## In Recognition of Eugene Mallove, His Promethean Quest, and His Magic

Scott Chubb and Thomas Valone

It is both reassuring and important to recognize individuals who present a vision of the future that transcends the usual, lowest common denominator of life's expectations. These people remind us through their living examples, as well as through their words, that things can be better, provided we do our best to make this happen. One year ago, we lost such a leader to a sudden and tragic death. This truly different and astonishing person was Eugene Franklin Mallove. Eugene was the Editor-in-Chief of *Infinite Energy* magazine, a provocative and gutsy technical magazine with a vision. Through this magazine, his book (*Fire from Ice: Searching for the Truth Behind the Cold Fusion Furor*), and his other publications, lectures, and related work, not only did Gene help to shape opinion about a controversial issue (cold fusion), but he was responsible for disseminating information about a more general, important, evolving, area of science (low-energy nuclear reactions) that has helped research in this new field to progress and evolve.

Both in a figurative sense and in more tangible terms, his efforts can be viewed as a Promethean Quest. Figuratively, the quest was Promethean because, as in the process of bringing fire to the earth, his work as a journalist, author, and scientist, was incendiary in nature, and revolutionary in scope. The response to his effort illustrates that the work was incendiary: his quest inspired ostracism, ridicule, and hardship. The efforts were revolutionary because they involved the dissemination of new ideas that are so radically different and potentially important that not only do they have the potential to dramatically alter mainstream thinking in Physics, but because of their volatility, simply through the process of bringing them to the forefront, Eugene Mallove's efforts have exposed serious flaws in how information about Science is disseminated. In more tangible terms, ironically, his efforts conceivably will be recognized as a Promethean Quest because historically they may very well be found to have inspired the development of sources of energy that in real terms can be compared to the discovery of a new source of "fire," in which water, effectively, will be burned, through new, harmless forms of room temperature nuclear fusion.

As a journalist and scientist, Eugene Mallove's optimism and idealism should be recognized by all who cherish the fundamental ideals of integrity and accountability. In report-

ing and documenting scientific breakthroughs, reporters can learn a great deal from his writings and the manner in which he conducted himself as a scientific journalist. In particular, Gene often wrote editorials regarding the Patent Office's ten-year moratorium against cold fusion patents and evoked letters of endorsement from Congressmen. But because his example has not been followed by others, considerable damage has occurred both inside and outside conventional science.

Instead of dealing with fads or sensationalism, Eugene Mallove worked as a scientific journalist with sincerity and integrity—to understand potentially revolutionary forms of science that have not been widely recognized. In 1989, his commitment led him to pursue and report experimental facts and experimental errors (and improprieties), while risking a secure career, in order to challenge prominent scientists in their hasty dismissal of cold fusion. Probing deeper into the evidence, he concluded that serious errors had been made by MIT researchers who were unable either to recognize or to admit their mistakes. Being an MIT graduate, he believed that the institution's commitment to science would eventually yield to a principled position. He pursued the matter because he felt that the individuals who employed him and individuals who had been involved in scientific research must be held accountable and be required to act with a degree of integrity for past actions and when they failed to do this, he felt compelled to act in a way that would ensure that, ultimately, their transgressions would be recognized. Forced to choose between job security and scientific integrity, Eugene Mallove quit a lucrative job and spent the rest of his life investigating and defending the established scientific method. From experiment to hypothesis to theory, in controversial (but potentially revolutionary) areas of science, Gene found that the scientific method taught in high school often is largely overlooked as a matter of political convenience by most government and academic institutions. Recently, the Union of Concerned Scientists reached the same conclusion and has initiated a campaign to restore scientific integrity in the government.

Mallove's intellectual journey became, in a sense, a spiritual one. As he became convinced that the unexpected and seemingly impossible could be real, he saw the possibility for elevating ourselves. His belief that we could become better



than we commonly believe touched those of us who knew him and changed our lives in ways that, now, he will never know. In a memorable quote from a videotaped interview with Gene, he predicted that powerlines will eventually become as useful as clotheslines. As distributed and decentralized energy steadily evolves into a mainstream commodity, for the sake of better reliability, experts predict that in the near future, electric utility power will probably be used only for backup, especially for industry.

Although Eugene Mallove is gone, his vision and greatness will ultimately prevail in the areas he was most concerned with: energy and its efficient use. His vision was not only authentic and important but also still holds revolutionary consequences. In the way he pursued experimental evidence, no matter how unsettling, and the necessary conclusions it supported, his chosen path was timeless, true, and just. By his example, he showed us that where it counts, each of us must have the utmost integrity and, in addition, be fully accountable for our actions. Truthfully, forthrightly, and idealistically, because of his beliefs in accountability and integrity, he took notice of events that revealed unscientific, unethical actions associated with scientific events. With time, not only did he question those actions but also the institutions that allowed these transgressions to take place.

Eugene's commitment grew from the implications of his insight: Imagine a world in which gasoline stations are obsolete; pollution from gasoline, oil, and all hydrocarbons is a long-lost memory; and one gallon of ordinary sea water can power an automobile to do all of the traveling that is currently done, in most automobiles, on the average, for a decade. Imagine a world in which it costs pennies to provide all of the power that is necessary to heat a home for fifty years or to convert sea water into fresh water and to pump the water into deserts, without pollution or cost, and to turn deserts into gardens. This was at the heart of Eugene Mallove's vision and was responsible for his determination and diligent investigation of the underlying facts of any emerging energy discovery. As a result of his efforts, Gene often included a lengthy editorial in *Infinite Energy* with all of the details of his effort to uncover the truth about a particular invention, besides the seminal articles that were chosen for that topic.

Faced with a potentially important discovery, he sought the truth and acted with unquestioned idealism and morality. In spite of repeated criticism from those who have characterized his efforts in relationship to cold fusion as being bogus or related to a form of "Voodoo Science," he simply assumed that facts concerning scientific events, combined with his dogged persistence, would eventually pay off. He also monitored work in other efforts involving potentially revolutionary discoveries related to energy, where he played an important role in correcting misconceptions and inaccurate (or incomplete) portrayals of the relevant science. In doing this, he helped to maintain a degree of accountability in contentious (but potentially important) areas of science by confronting individuals whose claims and actions have had questionable validity. His consistent, obstinate reliance on integrity and accountability alienated many individuals at MIT but earned him the admiration of many, in his later career as editor and publisher of *Infinite Energy*.

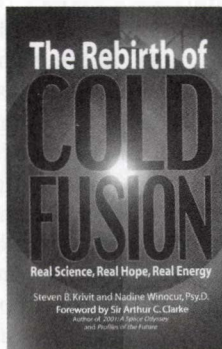
A recent issue of *IE* (#51) devoted to the Papp engine and related events has brought to light a potentially important

example of Eugene's forthrightness. In particular, during the evaluation of the particular device, developed by Papp, involving anomalous energy release during plasma discharges of noble gases, Nobel-prize winning physicist Richard Feynman inappropriately removed the source of electricity associated with the discharge process. When Papp attempted to stabilize the non-linear pulsing that subsequently resulted from Feynman's actions, the device exploded, and one of the witnesses of the event was killed. Eugene's forthrightness and truthfulness in reporting all of facts associated with this episode typify not only his efforts to understand and disseminate information about potentially robust sources of energy, but further illustrate a moral and ethical standard, based on accountability, in scientific journalism that has been missing in most mainstream reporting of scientific phenomena.

Eugene Mallove's sincerity was at the heart of what he did. The magic of his words and vision reflect this. He was tested by a seemingly impossible series of events, and despite this fact, he sought the truth, relentlessly. Throughout, he embraced a basic principle of personal and professional integrity: that at all costs, it is necessary to seek and speak the truth and be truthful to oneself in one's convictions and in what one cherishes. Truly great discoveries require scientists to persevere in this way. Truly great public figures, like Eugene Mallove, admire this and help to make it happen.

His magic was in the way he approached life and science: by constantly questioning, looking for answers, looking for the truth, and admitting his failures. We can capture some of his charisma and magic by following in his footsteps. Eugene Mallove has passed on, but his vision for a better twenty-first century world of "infinite energy" is just beginning. It begins with how we behave, one day at a time, with each person that we meet, and by believing in his vision: that we really can radically change the manner in which science is conducted and how energy is generated and distributed.

## The Rebirth of Cold Fusion: Real Science, Real Hope, Real Energy



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# Charge Clusters in Action

Ken Shoulders\* and Steve Shoulders

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## ABSTRACT

New energy transformations have been found using highly organized, micron-sized clusters of electrons, or EVs, having soliton behavior, with electron populations on the order of Avagadro's number. When interacted with solid material, these charge clusters perform a low-energy phase transformation type of atomic disruption that liquefies the lattice and propels the material to a high velocity without apparent signs of conventional heating. Using an ordinary thermal interpretation, a thermal gradient for bulk material greater than 26,000°C per micrometer would be required to achieve these effects. Evidence will be shown for the EV transiting the solid material, fluidizing it by contributing one extra electron per nucleon for a period considerably longer than the relaxation time, and then imparting momentum to the fluid. Under such conditions, the impact of this fluid on another solid buries a slug of solidified material to a depth of over 20 micrometers. This abnormal behavior introduces the notion of energy gain produced through a low-energy atomic and molecular phase change coupled with high recombination energy release. Evidence will also be introduced for the underlying energy production process stemming from the equivalence of an electron-annihilation energy release based on the manipulation of fractional electronic charge.

Scanning electron micrographs will be introduced showing EV borehole perfection, dual EV existence, and an electrically driven, sloshing type of material reflection in the borehole that is correctable with impedance-matching, micro nozzles. Micro thrusters using a 20 micrometer diameter and 100 micrometer long slug of non-explosive material will be discussed that are based on a spark-like propulsion process giving sufficient velocity to produce shock cones 70 micrometers apart at atmospheric pressure after being initiated from an energy source of 20 micro Joules. In vacuum, the ions from such a source travel 1 cm in 50 nanoseconds. As an example of the new energetics produced by EV interaction with material, data will be submitted on an intense light source having dimensions of a few micrometers and duration of several picoseconds arising from a form of synchrotron radiation. The basis for controlling the wavelength of this photon source from the visible light region to gamma wavelengths will be discussed. Micrographs will be shown of a low-energy nuclear reaction that has produced nuclear transmutations by using a nuclear cluster reaction process.

## BACKGROUND

This paper is about several interrelated discoveries that, taken together, will greatly improve our ability to produce and manipulate energy and material. The basis for this manipulation springs from the ability to cluster charge into

a dense, tightly bound packet instead of using individual electrons. It is also about what can be easily seen and proven right now with some pointers as to what lies ahead.

The original discovery of this charge compression and containment process was made in 1980. There was a description of the discovery process and electronic devices using such charge clusters published privately in 1987.<sup>1</sup> Several patents on electronic systems were subsequently issued in both 1991 and 1992.<sup>2</sup> Others have published three papers on the structural aspects of charge clusters.<sup>3-5</sup> In 1996 a paper was published by the authors on a low-energy technique for causing nuclear transmutations in matter.<sup>6</sup> All data produced so far is exploratory in nature and none of it is thought to be the last word.

During the years spent working on the electronic aspects of what I called EVs, a Latin acronym for strong electron, there were many sightings of very intense effects that had no place in an electronic technology. These effects were just swept under the rug, so to speak. Since work in the electronic phase was over, I have been busy digging out energetic effects from under the rug, dusting them off and seeing what they were. The effects have since been quantified to a degree that produces some utility, but there are still many mysteries left uncovered. This paper is largely a discussion of some of the minor or ancillary effects found. The good stuff that has been found will be published later when there can be no arguments about its utility.

## STRIKING EFFECTS

In the lingo of charge cluster technology, a strike is what an EV does when it hits a target. The effects produced can be very dramatic if the conditions are right. One mystery that had to be resolved early on is the difference between a spark and an EV. It was found that there is none. A spark is simply the visible, ionized gas trail left by an EV, although in some sparks the EV is so weak that it is barely detectable in the trash surrounding it. Every spark made has an EV running out in front of it. In addition, the EV has electron feelers running ahead of it to tell it what to do.

To demonstrate the above-mentioned point, an ordinary spark in air, produced by an induction coil, can be used to strike a foil of aluminum. What is seen under magnification is a mark that is characteristic of an EV strike. Figure 1 shows the front side of a 6-micrometer thick aluminum foil that has been struck by a spark carrying an EV. Figure 2 is the backside of the same foil. It is clear that a well-organized energy form has penetrated the foil. There is no lateral motion showing and this is a definite indication that the energy form was short and was not a long string of current





Figure 1. EV strike on 6 micrometer thick aluminum foil. Entry side.



Figure 2. EV strike on 6 micrometer thick aluminum foil. Exit side.

with a tendency to meander over the surface. Metals are hard for an EV to cope with, as the electron supply from the metal is too great for the EV order to continue. As a result, the range of penetration is only several micrometers in a good conductor.

Dielectrics and semiconductors is another matter entirely and a penetration range of over 1 millimeter per kilovolt is common. One convenient configuration for penetrating a dielectric with an EV is to lap the edges of two dielectric plates that are about 1/2 millimeter thick and press the lapped edges together. This gives a nice cross section view when EVs strike the micro-crack produced by joining the edges. The plates are then placed on a grounded foil of aluminum and an induction coil sparked to the crack on the side of the dielectric away from the grounded aluminum. Figure 3 shows an example of this method applied to aluminum oxide having a melting point of 2,050° centigrade.

As can be seen, there are seven distinct trails showing in the center of the edge view of the alumina plates. There is a slight taper on the top and bottom of the plate that makes the plates touch in the center and not at either the top or the bottom. Such a tapering technique gives control over the entry and exit angles for the EV. This is important, as it has been found that an EV must be terminated in its characteristic impedance just like any fluid flow or electromagnetic wave.

When the flow encounters a discontinuity, a reflection occurs. In order to have the EV make just one pass through

the material it is necessary to taper the output side as a small horn. If this is not done, sloshing will occur for both the EV and the material it propels.

### SLOSHING

Sloshing would seem like a trivial thing to consider if it were not for the fact that it is caused by a sloshing EV and this implies a very high degree of coupling between the EV and surrounding material. Figure 4 shows the entry side of one of the traces carved by an EV as shown in Figure 3. This particular channel was not well terminated and the EV rebounded several cycles before exiting the system. By carefully examining the overlap pattern of the material at the top of the channel, it can be seen that waves of material are laid down in a successive and diminishing pattern. More decisive evidence of this effect is shown in Figure 5 and Figure 6. Figure 5 is an optical micrograph of an EV strike on lead oxide glass. It can be seen that the material has been laid down in a sequence of two strokes. Figure 6 is a SEM photo of the same strike and gives a different view of the effect. As can be seen, the borehole is quite smooth and two waves of deposit are apparent and proper EV impedance termination is almost accomplished. Figure 7 shows an example of a strike on lead glass that is even nearer to termination. In addition, this micrograph shows a dual EV strike in which paired EVs travel side-by-side and enter the material at precisely the same time. The freezing pattern testifies to the time coincidence.

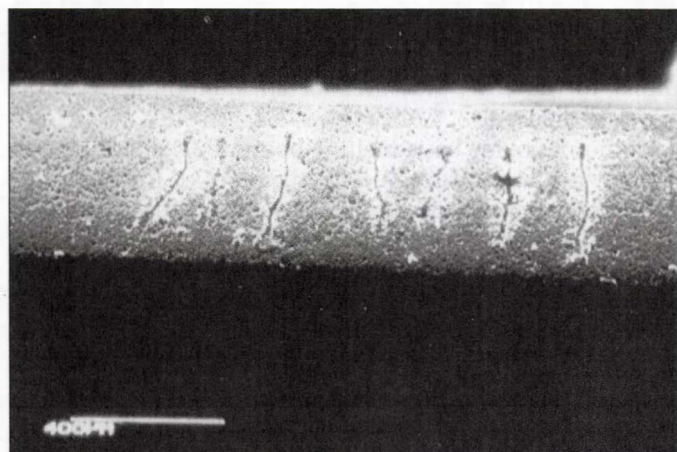


Figure 3. Cross section of EV boreholes through 1/2 millimeter thick aluminum oxide plate.

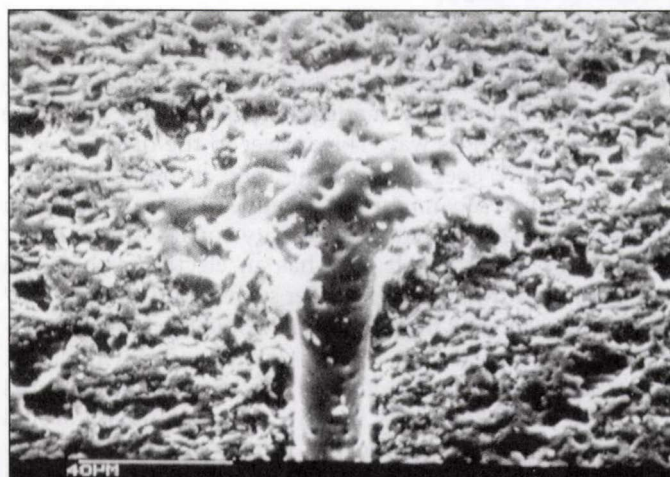
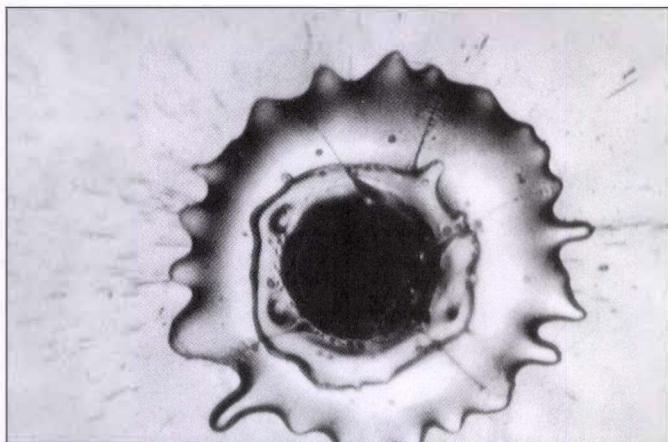
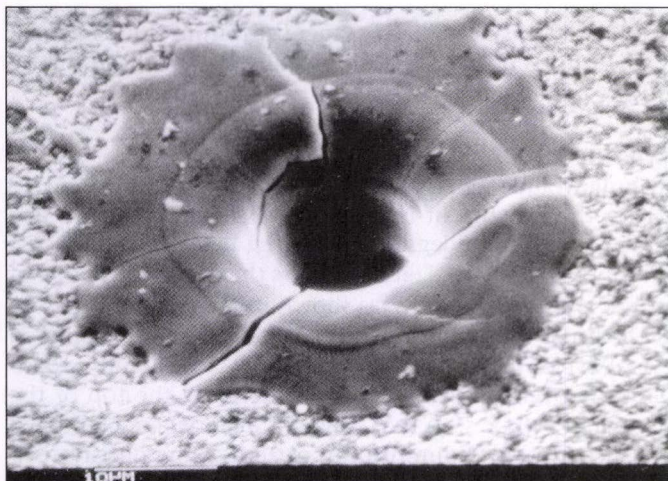


Figure 4. Entrance cross section of EV borehole in aluminum oxide showing sloshing cycles.





**Figure 5.** Optical micrograph of EV entrance into lead glass showing wave action of sloshing.



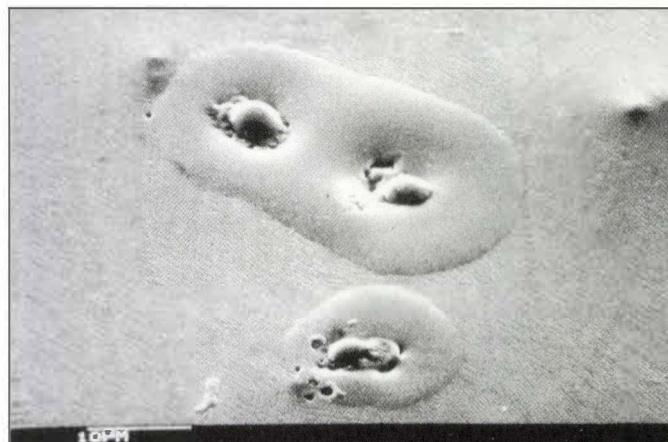
**Figure 6.** SEM micrograph of EV entrance into lead glass showing wave action of sloshing.

A third strike also shows in Figure 7 but is not related to the dual EV.

The technical importance of this sloshing, being an indication of EV movement, is that as a measurement method, we are able to see EV movements in places not heretofore visible. Some of the motions are essentially frozen in place. As will be shown in a later section, the cause for an extremely intense, microscopic light source can now be seen as an oscillatory EV motion.

#### MATERIAL DISRUPTION

A question that comes up with the sloshing argument is concerned with how an EV manages to get around all of the material that is in its way. The answer to the question is, it doesn't. The EV goes through the solid or liquid material. When measured separately,<sup>1</sup> an EV appears to be a collection of electrons that has a number density equal to the number of nucleons in a solid. It thus has an electron population equal to Avogadro's number. Under such conditions, if an EV passed through solid material, there would be one extra electron contributed to the lattice per nucleon. Correspondingly, the electronic bonding of the material would be nullified and a liquid or gaseous phase would result. After passage of the EV, things would take a few moments to sort themselves out and return to the lowest energy state available. This would be classed as an atomic



**Figure 7.** Dual EV entrance into lead glass showing synchronized arrival of EVs.



**Figure 8.** Aluminum oxide deposited on 6 micrometer thick aluminum from EV boring through aluminum oxide.

disruption process and not a conventional melting.

Presumably, the energy required for disruption is less than for melting, as the electrons are not necessarily excited. Evidence supporting this assumption is shown in Figure 8. This is a micrograph of the material that was deposited on a 6-micrometer thick aluminum foil placed near the exit side of the boreholes in the aluminum oxide. There are two overlapping deposits showing, indicated by a slightly circular configuration, that have an almost electrified appearance. Figure 9 is a magnified view of one circle of material and it shows a high degree of consolidation for the deposited liquid. There is also the characteristic dimple showing that is similar to the entry side view of an aluminum target, as shown in Figure 1.

Aluminum oxide has a melting point of 2,050° centigrade and yet, it has not raised the temperature of the thin substrate material in any perceptible way. Even a thin coating of low temperature wax on the surface, to serve as a temperature indicator, remains undisturbed unless the aluminum oxide directly contacts it. Additionally, the surface tension of the aluminum oxide fluid is so low that it runs out to almost an atomically thin edge and there is no indication of evaporation of the aluminum oxide onto immediately adjacent surfaces. This behavior is contrary to what happens when a molten particle of aluminum oxide from a thermal melt strikes the surface. Under this condition, even a particle of a



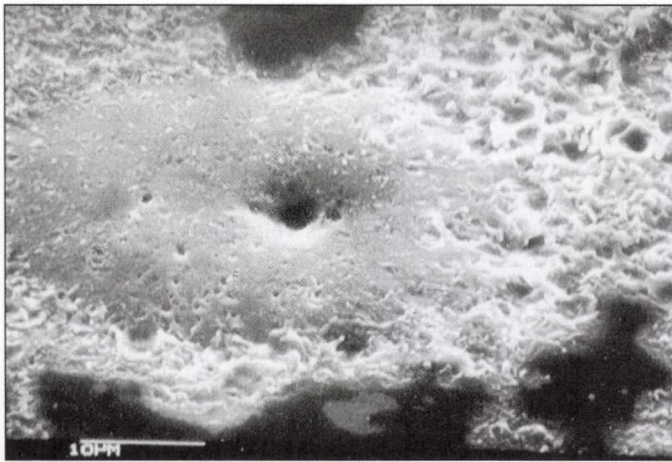


Figure 9. Magnified view of consolidated aluminum oxide ejected from borehole.



Figure 10. Backside of a 6 micrometer thick aluminum foil struck with an EV and a deposit of aluminum oxide.

few microns in diameter partly melts into the aluminum foil, has a high contact angle, and also evaporates a decoration of aluminum oxide on the immediately surrounding surface.

The conclusion that can be reached from these observations on disruption is that this is not a very high temperature process and that it does not take much energy to do the job.

Another conclusion concerning the order of events can be found by referring to Figure 10. This is the backside of the 6-micrometer thick aluminum foil immediately under one of the deposits. What can be seen here is a strike mark similar to Figure 2 which is characteristic of the exit side of an EV strike. It appears that the EV has transited the aluminum oxide and struck the aluminum foil before the aluminum oxide fluid arrived. This is in line with an earlier conclusion that the EV first disrupts the material by passing through the solid, then liquefies it and imparts momentum to the fluid. In this scenario, the EV is what moves the fluid. Guide the EV and you guide the fluid.

#### PLAYING WITH SPARKS

The following experiments graphically shed much light on EV energetics and point to a very interesting new light source and deposition method for refractory materials. All

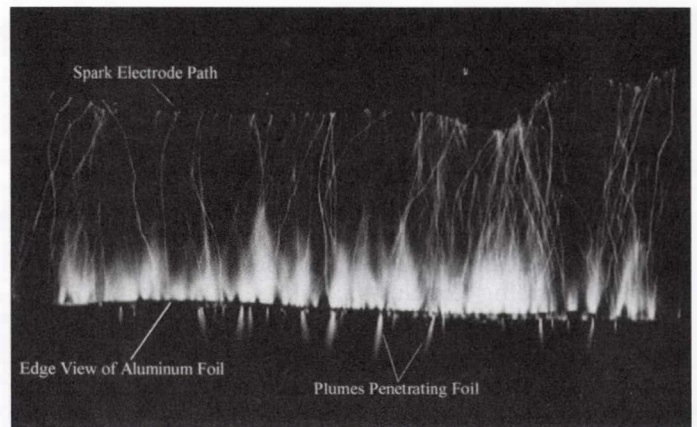


Figure 11. Time exposure of a side view of a 0.001 inch thick aluminum foil, coated with silicon carbide, being sparked by an induction coil from a moving electrode located at the top of the photo. The small jets seen coming from under the foil have penetrated through it.

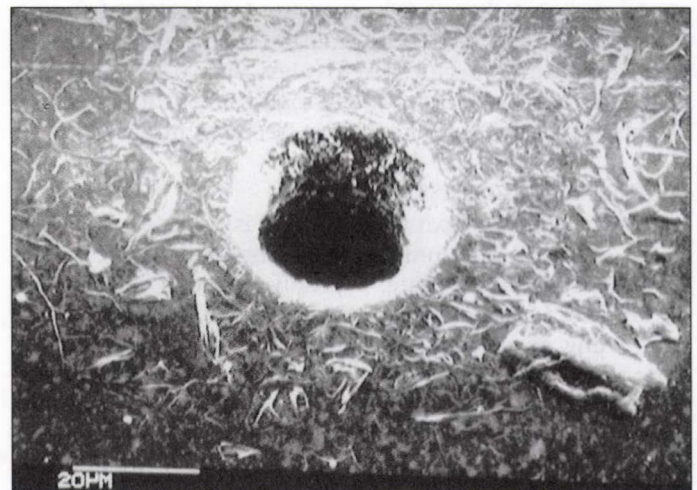


Figure 12. Entry side of an EV strike on silicon carbide grain coated on a 0.001" thick aluminum foil.

that is needed is an aluminum foil coated on one side with silicon carbide grains and an induction spark coil.

Figure 11 is a side view of the aluminum foil described above that has had a time exposure taken of it as the spark coil is run across the foil sparking on the silicon carbide coated side. The spark, containing an EV, strikes the silicon carbide grains, bores through the coating, and gains enough energy to penetrate the aluminum foil and emerge into the air on the other side. In the photo, the sparks start at an electrode near the top of the frame. Streaks are seen running down to the silicon carbide side of the foil that is held edge-wise to the camera. In many places jets of light appear past the foil. There are two types of jets showing. One of these is short and blue while the other type has a white-orange appearance. [Color variation not shown here; see image on cover.]

Several things can be seen on the front side of the foil. At the ends of the foil, both on the left and right side where there is no silicon carbide coating, the strikes do not penetrate at all. In the active center region, the flares coming from the silicon carbide coating are large and are moving backward toward the spark electrode. Reflected material due to sloshing from mismatching the EV causes this spray. The EV penetrates many of the sites but is pulled backwards and carries the material with it.



A typical borehole entry is shown in Figure 12 for a silicon carbide coating that has been mixed with epoxy to hold it on the aluminum foil. Figure 13 shows the exit hole in the aluminum foil used to support the silicon carbide and act as a ground for the spark. The borehole is fairly clean for a process that is capable of fluidizing a material with a melting point of 2,600° centigrade and projecting it to an unholy velocity. In fact, when a special test is set up to determine the thermal gradient at the edge of the borehole, one comes to an astounding conclusion: either a gradient of over 26,000° centigrade per micrometer exists here, or this is a non-thermal process.

To arrive at this number for the thermal gradient, I used a very low-melting point material for the silicon carbide binder, and let the EV pass through the composite target. In one example, paraffin wax was used for the binder and both colloidal graphite and silicon carbide were used as fuel in two separate tests. The boreholes produced by EV passage were so perfect that the cusp of the intersection between dual EVs could be seen. This indicates that the entire 2,600° temperature drop occurred across less than 0.1 micrometer of space. That is an astoundingly high gradient for essentially bulk material. Therefore it must be something else.

## DEPOSITION PROCESS

If material from the exit of a borehole is collected on a substrate, such as aluminum foil, it will be found to be deeply implanted in the substrate. Typically, a silicon carbide slug digs in about 20 micrometers. Of course, in the example just cited using an aluminum foil carrier plate, the aluminum plate will also be deposited. An example of a single shot of silicon carbide on aluminum shows in Figure 14. The high velocity of the deposit not only buries it deeply but also scatters it with high energy. Even with this scatter, there is not much material lost, and for some mysterious reason very little shows up in the region of the aluminum exit hole immediately above the deposit. It all seems to be blown sideways.

The appearance of the deposit can be varied over a wide range by velocity control. Figure 14 shows a scattered deposit of silicon carbide and Figure 8 and Figure 9 represent coalesced deposits. In adapting this process to a useful technique for producing mechanically robust materials with high efficiency, it is necessary to properly overlap many successive shots. To do this, either a slurry source of material or multiple layers of source material are needed.



Figure 13. Exit side of an EV strike on silicon carbide grain coated on a 0.001" thick aluminum foil.

## MICRO THRUSTERS

If the source of material propelled by EV action is viewed sideways, small shock cones can be seen coming out of a micro nozzle. The spacing of these cones is typically 70 micrometers at atmospheric pressure. That represents a very high velocity and high specific impulse. The electrical energy input to push a 20-micrometer diameter by 100-micrometer long slug of material to this velocity is only 20 micro Joules.

When a measurement of the ejected particle velocity is made in vacuum using a source that is vacuum compatible, the highest particle velocity found is 1 centimeter in 50 nanoseconds. These particles are detected as ions. There is also a large number of slower ions and neutral particles made at the same time. The propulsion mechanism is not known in detail but it could be similar to those used in xenon clusters excited by laser irradiation<sup>6</sup> in that a similar containment mechanism could be used for both. The xenon cluster technique produces particles with megavolt energy levels.

## A FANTASTIC LIGHT SOURCE

If instead of catching silicon carbide on an aluminum foil, as was shown in Figure 14, we put a photographic film in place of the aluminum, a situation is set up for seeing the photon image of what happens coming out of a borehole. Additional data can be collected if we put a fine-meshed, metal screen over part of the film to act as an object for point projection microscopy. The screen also acts as a filter of radiation allowing us to detect any X-rays present. If incandescent particles come out of the borehole, we also have a recorder for their motion across the surface of the film.

By doing this simple experiment we can collect a large amount of data with little effort. As a matter of fact, all of the data in this paper was collected with an expenditure of less than \$300.00 for all apparatus and material. Of course, it took a lot of time and the data could not be communicated without the microscopy used. Nevertheless, the exploration was carried out with only the most meager apparatus. This is not difficult work and it seems that a lot of this kind of new energy science can be carried out in garages.

When the experiment is set up as indicated, the photographic result shows in Figure 15. This is a positive image showing white where light strikes the film. Several things can be seen. On the top and upper left there are white spots with streaks emanating from them. The central white spot is



Figure 14. Single shot of silicon carbide ejected from a borehole into a foil of aluminum.



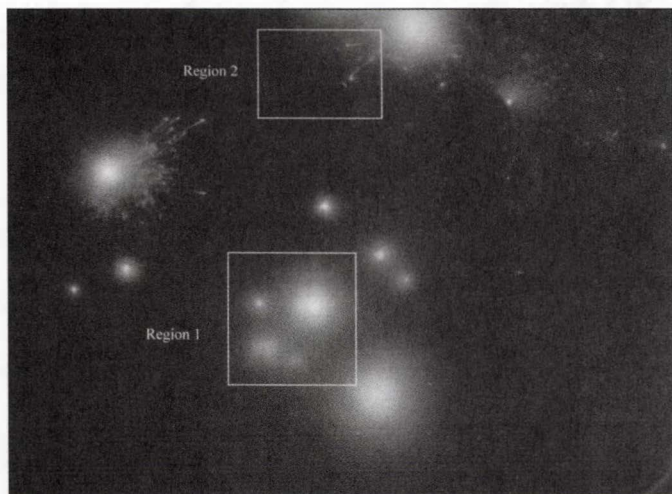
where the borehole of ejection was located. This corresponds to the long plumes shown on the lower side of Figure 11. The silicon carbide hit the gelatin surface of the film and rolled across it leaving trails that eventually stopped, and in some cases, turned back and parked as spherical balls. This is another piece of evidence that the ejected material was not hot enough to harm emulsion although it produced visible light.

Note that some of the white spots do not show any deposited material. This is a fact that was confirmed by careful examination of the emulsion surface. These spots correspond to the short, blue plumes on the lower side of Figure 11 [see image on cover for color]. What happened here is that the EV first emerged and then turned around, due to mismatch conditions, and took the load of fluidized silicon

carbide back with it to make a large whitish plume showing on the top side of Figure 11. In this case, all of the momentum that had been given to the fluid was taken back by the EV and then restored in the opposite direction. This is normally thought to be a difficult job. At the risk of being even more conjectural, I would suggest that someone look at the new rules for mass manipulation in this EV domain.

There is a grid that faintly shows within Region 2 of Figure 15. Figure 18 shows this magnified. This is the edge of a 200 mesh, copper grid having a 0.001-inch wide wire spaced every 0.005 inches. The grid is used for projection microscopy. Region 1 is outlined and magnified in Figure 16 and is one of the projected images caused by several point light sources produced by the process. Close inspection shows grid images at various magnifications caused by the light source occurring at different distances from the screen. The closest spacing from the screen produces the largest image. Figure 17 is a similar image from a different shot that has slightly higher contrast and a better grouping of the light sources. The grid distortion is caused by the different magnifications being melded or merged together due to different locations of the light source. In another image magnified from Figure 15, Figure 18 was taken from the top section of the screen called region 2. An image of the screen corner can be seen in this photo.

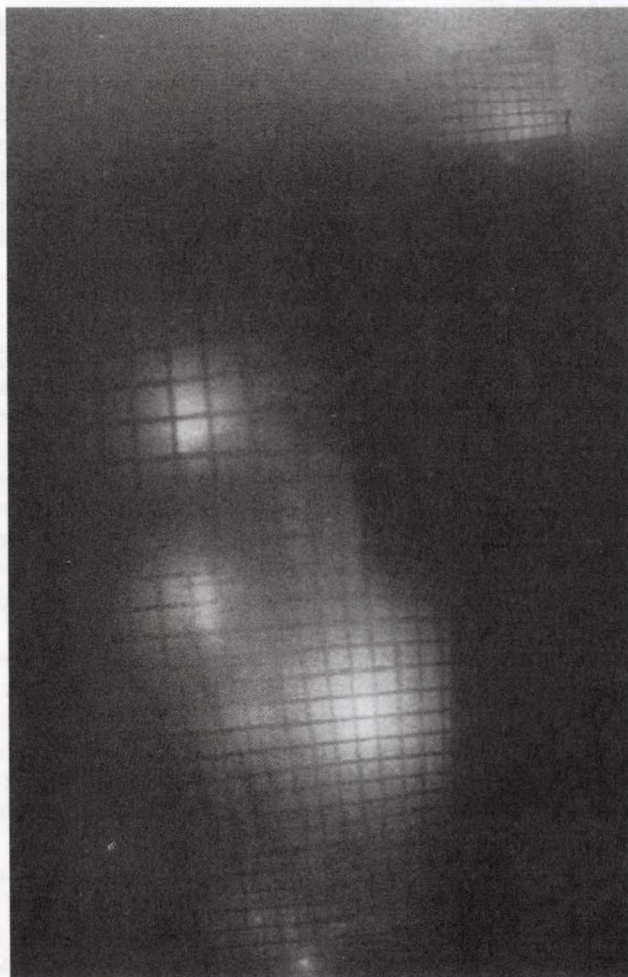
One of the interesting effects shown in Figure 18 is the ball of silicon carbide that has come to a stop near the lower right corner of the photo. It stopped near a small conical



**Figure 15.** Positive image on photographic film of silicon carbide ejection from borehole. Point projection images from 200 mesh screen show in outlined area.



**Figure 16.** Magnification of region #1 from Figure 15.



**Figure 17.** Point projection magnification of screen image taken from another shot similar to Figure 15.





**Figure 18.** Magnified view of region #2 in Figure 15. The lower portion shows an image of the 200 mesh screen used. Many dust specks cast a sharp shadow from the point light generated by EV acceleration.

shape on the surface. There is no thermal damage to the photo emulsion showing here in spite of the high melting point of silicon carbide. Immediately above the cone is a particle of dirt that casts two shadows in almost orthogonal directions. These shadows are caused by the two light sources shown coming from off the screen. There are also many other shadows sharply cast from even smaller specks of dust. Each of these particles attests to the size of the light source that illuminated them.

The sharpness of the wire image essentially gives an upper limit of the light source length and the sharpness of the shadow from dust specks give the lateral dimension upper limit. Taking these two bits of data together it can be said that the light source has an upper limit in size of 5 micrometers for both dimensions. This is about 1/4 the dimension of the bored channel.

From other measurements we know what the velocity of an EV is under normal conditions. They typically run at about 0.1 the velocity of light in a vacuum guide but slow down according to their interaction with the medium they operate in. Under the operating conditions used here, a turn-around time of several picoseconds is expected. This is an estimate from other measurements and not a direct measurement of existing conditions. This turn-around represents an acceleration of charge that usually produces light emission. It is essentially synchrotron radiation that would produce a wideband, chirping spectrum. The length of the light pulse would thus be on the order of several picoseconds.

It is the turn-around time or stopping rate that exercises a major control over the emission wavelengths. In the geometry used here, where the dimensions are somewhat large and the retarding field is soft, one would expect nothing higher than optical frequencies to be generated and that is what is found by using filters between the light source and the film. The highest frequencies lie in the UV region.

It has been found from past experience that stopping an EV on a low-inductance, high mass material can generate X-rays.<sup>1</sup> The stopping rate is high under such conditions. In other experiments, using double EV structures, where shock waves were set in collision, gamma emissions were measured.<sup>7</sup> This is a common occurrence that could happen



**Figure 19.** EV strike on a deuterium loaded palladium foil.

under many experimental conditions accidentally set up and could be the cause behind reports by others on gamma emissions.

The intensity of the light source during its brief life can be estimated from knowing the sensitivity of the film and the distance from the source. These estimates indicate that around 100 billion photons were emitted. This is an extremely intense source for a short period of time.

#### LOW-ENERGY NUCLEAR TRANSMUTATION

Data taken from a previous paper presented at a low-energy nuclear reaction conference shows evidence of EV transmutation of material.<sup>8</sup> Data from this paper are shown in Figure 19 and Figure 20. Figure 19 shows an EV strike on a foil of palladium that had been previously "loaded" with deuterium. When this foil is analyzed in detail with an X-ray energy dispersive analyzer, it shows as clean palladium in all places except those bombarded with EVs.

Many of the bombarded areas, but not all, show that nuclear conversions have taken place. The new materials showing are mostly silicon, calcium, and magnesium. Figure 20 is an analysis of the EV damage area shown in Figure 19. These converted areas typically show a brittle characteristic before bombardment.

It is known from extensive bombardment of pure materials that efficient nuclear conversion cannot be expected from simple, large EV structures. Conversely, when an EV is loaded with nuclei, nuclear conversion does occur but it is not nearly as efficient as the process using a "loaded" substrate. The explanation lies in the need to have very small EV structures for quick stopping. In a loaded material it is likely that fracto emission of electrons occurs arising from the brittle nature of the material. This produces small EVs. Observation of EVs with diameters down to 0.1 micrometers is easily done. Below that value analysis is complicated by the granularity of the substrate material. It is the size range of around 200 angstroms that is of interest for transmutation, however large EVs serve as effective triggers for partly loaded areas capable of producing fracto emission.

#### FREE ENERGY?

Theories and ideas have almost no value at all in our world. Laboratory demonstrations are worth very slightly more. These notions stem from trying to sell paper inventions and finding it is a process that stops creative work. To my way of



thinking, it is only a properly engineered device that has real value—and that is what we are trying to do.

Throughout much of this work on EV energetics it has been obvious that we get more energy out of certain experiments than we put in. The work being described here also falls in that category, although the engineered version using any of these effects in an energy-producing device falls short of a great thing. The really good stuff for legitimate products is still to come and we are working on it. Trying to market a bad, free energy (or cheap) approach is not good for the field even if it sounds wonderful at first.

Getting a good lab result from an idea and being able to work it into something better is our forte. Making a theory out of good ideas or results is not for us. However, I have to have some vaporous thoughts to hang onto as I go along my path. To do this I have learned that standard words must not be attached to new notions. One invariably bends the work to follow the standard direction instead of taking the new path that is the proper one. An example of this is that, as far as I am concerned, “cold fusion” results may not be nuclear at all when the base cause is found. We see EV processes that are capable of causing similar low-energy nuclear reactions as a side effect. I do not know what the base cause for these is, but I am inclined to say a few things bearing on potential energy producing techniques that I use as my own tenuous guide rail.

Take the example of a steam engine that could run without putting any energy into producing steam. As long as everything else worked the same, that would be a pretty good free energy device. We have talked about being able to bring about a phase change, changing solids to gas, by using an EV disrupter. Looks like a steam engine is in here somewhere. Go to a well-known process for producing really high temperatures, such as molecular dissociation and recombination, and use the same type of process to dissociate nitrogen or hydrogen. Can such a cycle really become an engineering reality?

Even though these processes could possibly be made to work, one is still left wondering where the energy comes from. In a search for an answer to this question, I have made sure not to hang a conventional name on the process. Having done this I have complicated the communication of ideas, but that is not a problem as long as we don't talk to anyone until the final machine we have completed communicates the notions for us.

In an effort to get across in this paper the notions that guide me, I am going to fracture conventional words in such a way that some meaning is implied as long as they are not taken too rigorously. I am going to use the notion that the energy excess we see comes from a form of electron annihilation. Of course, I don't mean the usual electron-positron type. Instead, I am going to invoke the latest buzzword and say that it is fractional electron charge I am talking about. If electron fractions really exist, as some experiments by others indicate they do, then I will use the process of their annihilation into electrons for my energy gain.

One of the main requirements is to take the electrons apart in an energetically favorable way. The existing experimental process is said to require a high magnetic field producing a vortical flow of charge. That is likely to exist in an EV.

In another look at the problem from a wider viewpoint, there are several things about an EV that are different

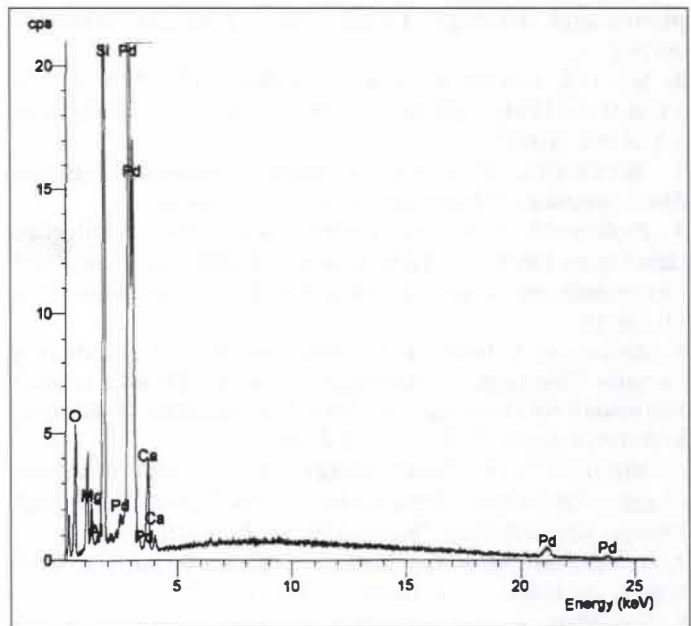


Figure 20. X-ray analysis of the crack shown in Figure 19 showing new material produced.

enough from conventional theories to lead one to wonder if electrons are contained in their usual form. From many EV measurements it has been found that there is a diminution of expressed charge in an EV. It is easy to account for the number of electrons that go into them and come out. The dimensions are also well known, but classical calculations of surface field are several orders of magnitude below what one would expect. Additionally, EVs have the measured charge-to-mass ratio of an electron, but with the low expressed charge problem, they seem to have lost mass also. There are still a lot of basic things to work out, because at this point, we don't even know if we are dealing with contained electrons or something else.

There is one thing found in common with all energetic processes involving EVs. The EV must be irritated before energy is released in any form. That is possibly why the EV strikes shown in Figure 11 that land on the bare aluminum do not show any energy release. On the other hand, those that have to irritate their way through the silicon carbide give up much more energy as they regenerate. This observation could be just an illusion caused by a bad power match to the spark. I treat the irritation process as one capable of disheveling an electron into fragments, as only one phase of electron existence, so that these fragments can later unite and release energy. That's also fusion.

Two things are certain: 1) EVs are always involved in any of my processes capable of interesting energy permutations, and 2) lots of new rules are needed to cover new findings. From my viewpoint, I see only a good future for this energy field.

#### ACKNOWLEDGEMENT

The authors are everlastingly grateful to Tom Shanks for his total support of this work.

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#### About the Authors

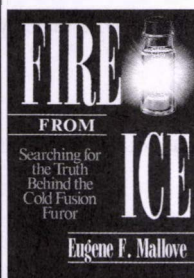
Ken and Steve Shoulders have worked together continuously in their own laboratory as a father and son team since the discovery of charge clusters in 1980. Present day work, in 2005, concentrates on advanced energy and propulsion solutions using EVOs (Exotic Vacuum Objects) as a variant on elementary charge clusters.

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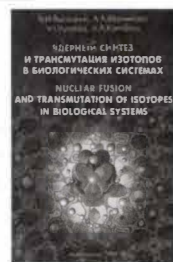
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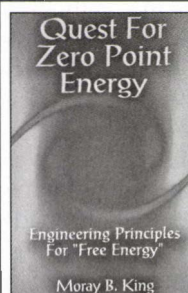
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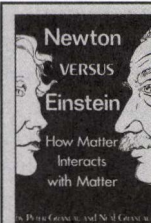
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# Cold Fusion Explosion and Accident Report

Steven B. Krivit\*

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On January 24, 2005, at around 4:00 p.m., an explosion rocked a cold fusion laboratory at Hokkaido University, Japan. The experimental design was the plasma electrolysis method, one of several methods used to perform cold fusion experiments. Physicist Tadahiko Mizuno, one of Japan's most experienced cold fusion scientists, and a guest of his were in the laboratory at the time of the explosion.

Mizuno and the guest suffered wounds to the face, neck, arms, and chest from shards of glass. A large piece of glass next to Mizuno's carotid artery was safely removed.

"I feel fortunate that neither of my eyes were seriously wounded and that neither I nor my guest were seriously wounded," Mizuno said.

However, the explosion was so loud that it rendered both victims temporarily deaf. A week following the accident, their hearing recovered, though Mizuno said that the "singing in the ear continues strongly."

A definitive explanation is unknown, though Mizuno suspects that a mixture of hydrogen and oxygen in the headspace of the cell was ignited. Mizuno has performed these experiments hundreds of times, and this apparatus had been well-tested over the last five years.

Before the experiment, Mizuno had checked all of his equipment and had made sure that the exhaust tube was clear.

"The outlet tube leading to the mass spectrometer was definitely not blocked or impeded, so the gas in the headspace was at one atmosphere," he reported.

A high-pressure build-up of hydrogen and oxygen has been ruled out.

At the time of the explosion, a collector that would normally have aided in the collection and removal of the effluent gasses was removed, though this was not unique.

"The funnel around the cathode was taken off for the analysis of the generation gas during plasma electrolysis," Mizuno said. "I have performed such measurements 40 times in the past and confirmed the safety of this procedure many times."

Mizuno turned the experiment on when he arrived in the laboratory that afternoon. It had not been on long enough to develop the plasma, which usually takes about 20 min-

utes. About five seconds later, when he observed that electrolysis started, he increased the voltage to 20 volts and the current to 1.5 amps. About five or six seconds later, Mizuno reported seeing a bright white flash of light from the submerged portion of the cathode, where the plasma normally would develop.

The light "expanded, and at the same instant the cell exploded," Mizuno said. The safety doors to the incubator were blown open, and glass and electrolyte were blown up to 6 meters from the experiment platform.

Mizuno documented the event in his accident report, which can be found online at the *New Energy Times* website: <http://newenergytimes.com/news/2005MTExplosion/Explosion.htm>. He listed several possible causes, though he was tentative about any of the prosaic explanations.

Chemist Dieter Britz from the University of Aarhus was curious about how such a small amount (3cc) of hydrogen gas might have caused such a large explosion in the cell.

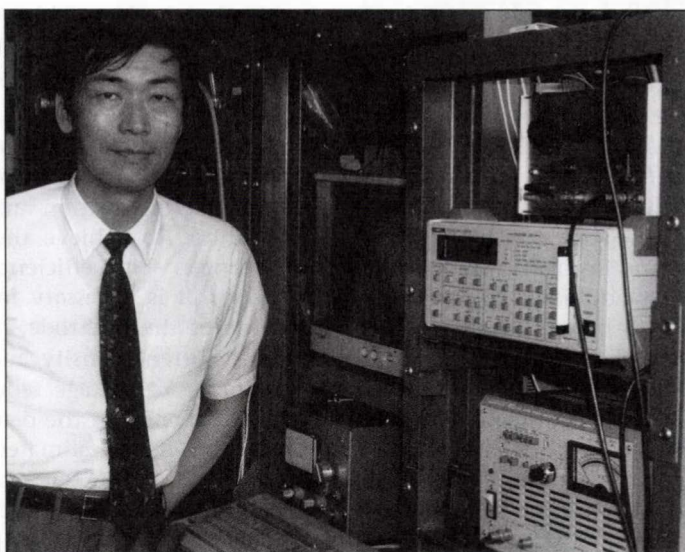
"It is also hard to imagine that there should have been enough for such a violent explosion," Britz said. "You have no doubt seen the school experiment, where a lighted taper is inserted into a tube with some hydrogen in it. You get a nice 'pop.' In an open cell, [such as this] after a short time of electrolysis, that is what I would expect. So this is very

strange, and I have no guesses."

The explosion was perhaps similar to the one on January 2, 1992, which killed SRI International researcher Andy Riley, though the SRI cell was closed and under high pressure. Mike McKubre, the director of the energy research center at SRI, who was wounded in the 1992 explosion as well, cautioned that any exposed metal can cause a recombination explosion.

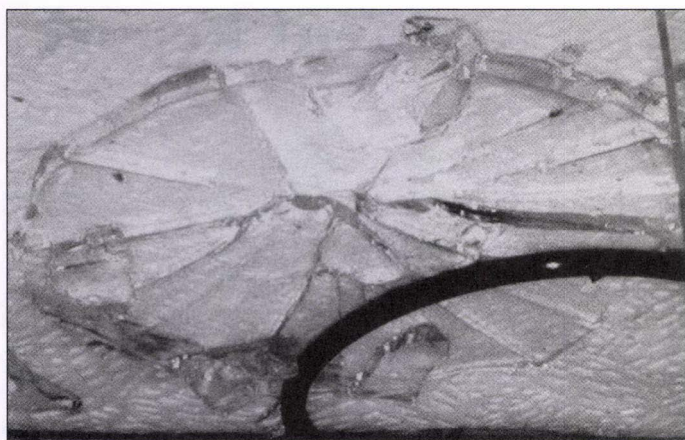
"I found it is impossible to impress on people just how explosive a stoichiometric mix of hydrogen and oxygen is," McKubre said. "Even a few cc's can be dangerous, even deadly. You don't need to search for an ignition source. Any metal will do."

The only other well-known cold fusion explosion was that of Martin Fleischmann and Stanley Pons in 1985, though a source who wishes to remain anonymous states that the



Dr. Tadahiko Mizuno, in his laboratory at Hokkaido University in 1999.





Radial fracture pattern of the bottom of the flask after explosion.

Photo by Tadahiko Mizuno.

Lawrence Livermore National Laboratory had a Fleischmann-Pons-type explosion in 1989, as well.

Mike Carrell, a previous board member of Cold Fusion Technology, postulates a two-stage reaction in the Mizuno explosion. "First there is a spark or flash, then an expanding glow, then an explosion," Carrell said. "When the disturbance reaches the surface, the stoichiometric  $H_2-O_2$  mixture may well have ignited, contributing to the explosion."

Horace Heffner, a cold fusion enthusiast, offered this analysis. "It appears that the explosion may well have been ignited in the flask, but the main energy from the explosion came from the top interior of the Yamato 1L-6 incubator. It looks like the explosive force was primarily downward, and the overpressure on the conical cap on the flask blew the flask apart in radial directions, leaving the base cracked but in place. It looks like the base of the flask may be stuck (by prior heating) to the polypropylene insulation underneath it. . . Assuming the plastic door was not blown to pieces, the overpressure was clearly enough to blow open the plastic door before the glass shards went through the open door. This indicates the overpressure hit the door before the flask pieces. The source of the blast pressure that opened the plastic door was therefore not inside the flask but rather probably coming from the top of the 1L-6 downward."

Heffner speculated that hydrogen from the reaction flask is dumped into the interior of the 1L-6 where it can accumulate in various spaces and thus be exploded by an ignition event in the flask.

The big question on everyone's minds is whether this was a chemical explosion or a nuclear explosion. A physicist who considered the amount of energy required to convey the 800cc of electrolyte a distance of up to 6 meters, was unconvinced that this was a chemical reaction.

Jed Rothwell, who translated Mizuno's book, *Nuclear Transmutation: The Reality of Cold Fusion*, to English, assisted with this story and reports that Mizuno is back at work starting the experiments again, despite the trauma.

"Mizuno has guts," Rothwell said. "All cold fusion researchers have guts. They are an ornery bunch, but you have to admire them."

Photographs taken by Mizuno and others are online at: <http://newenergytimes.com/news/2005MTExplosion/Explosion.htm>.

Despite the recent interruptions to his research, Mizuno

has recently succeeded in getting the paper, "Hydrogen Evolution by Plasma Electrolysis in Aqueous Solution," published in the *Japanese Journal of Applied Physics* (Vol. 44, No. 1A, 2005, pp.396-401, <http://jjap.ipap.jp/link?JJAP/44/396>). His co-authors include Tadashi Akimoto, Kazuhisa Azumi, Tadayoshi Ohmori, and Yoshiaki Aoki (all from Hokkaido University), as well as Akito Takahashi from Osaka University. The text of the abstract follows:

Hydrogen has recently attracted attention as a possible solution to environmental and energy problems. However, hydrogen should be considered an energy storage medium rather than a natural resource. Free hydrogen does not exist on earth.

Many techniques for obtaining hydrogen have been proposed. It can be reformulated from conventional hydrocarbon fuels, or obtained directly from water by electrolysis or high-temperature pyrolysis with a heat source such as a nuclear reactor. However, the efficiencies of these methods are low. The direct heating of water to sufficiently high temperatures for sustaining pyrolysis is very difficult. Pyrolysis occurs when the temperature exceeds 4,000°C. Thus, plasma electrolysis may be a better alternative.

It is not only easier to achieve than direct heating, but it also appears to produce more hydrogen than ordinary electrolysis, as predicted by Faraday's laws, which is indirect evidence that it produces very high temperatures.

We also observed large amounts of free oxygen generated at the cathode, which is further evidence of direct decomposition rather than electrolytic decomposition. To achieve the continuous generation of hydrogen with efficiencies exceeding Faraday efficiency, it is necessary to control the surface conditions of the electrode, plasma electrolysis temperature, current density and input voltage. The minimum input voltage required to induce the plasma state depends on the density and temperature of the solution. It was estimated as 120 V in this study. The lowest electrolyte temperature at which plasma forms is 75°C. We have observed as much as 80 times more hydrogen generated by plasma electrolysis than by conventional electrolysis at 300 V.

#### About the Author

Steven B. Krivit is the coauthor of *The Rebirth of Cold Fusion* and the senior editor for *New Energy Times*, a newsletter and website specializing in cold fusion news and educational information (online at [www.newenergytimes.com](http://www.newenergytimes.com)). He is one of the world's leading experts on the field of cold fusion; he regularly communicates with over 70 researchers from 11 nations.



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# The Failure of $E=mc^2$

Peter Graneau\*

The 2005 John E. Chappell Memorial Lecture of the Natural Philosophy Alliance,  
presented at the NPA 12th Annual Conference, May 2005.

Over the course of some years I have had many long and intense telephone conversations with John Chappell. We were in full agreement with regard to the unsatisfactory status of the teaching of physics. Our arguments concerned what the Natural Philosophy Alliance should do to try to remedy the situation. John felt our primary purpose was to reveal to the profession and the general public what is wrong with Einstein's relativity theories. My view has been—and still is—that science would be better served if we proposed and discussed alternative physics paradigms. However, to honor Chappell's wish in this lecture, I will comply with it and criticize relativity theory.

## Abstract

The origin of  $E=mc^2$  is a three-page paper by Einstein published in 1905, just a few months after the special theory of relativity appeared in print. In the short paper Einstein gave an affirmative answer to the question: "Does the inertia of a body depend upon its energy content?" His derivation of the mass-energy law was not based on the special theory of relativity but on Maxwell's electromagnetic field theory. After World War II and the explosion of atomic bombs, Einstein returned to  $E=mc^2$  in two essays. He again claimed that the formula was inherent in pre-relativistic physics, but now Newton's law of momentum conservation was foremost in Einstein's mind.

Problems with the mass-energy law arose in the restricted area of electrodynamics. It was not until the 1980s, decades after Einstein's death, that Pappas of the University of Athens, Greece, demonstrated with a ballistic pendulum that, if momentum is conserved,  $E=mc^2$  predicts the consumption of far more energy than was actually expended in his experiment. In the same way, the mass-energy law has been disproved with railguns and induction motors.

$E=mc^2$  is not a law of the Newtonian electrodynamics which preceded the Maxwell-Einstein field theory. Abolishing the instantaneous matter interactions of the Newtonian physics paradigm, therefore, appears to have led to Einstein's law. Nothing said in this talk precludes the validity of  $E=mc^2$  in nuclear physics.

## The Origin of $E=mc^2$

In the history of science it is difficult to find a simple mathematical formula which has had a greater impact on humanity than  $E=mc^2$ . It persuaded the President of the United States to launch the Manhattan Project and develop the atomic bomb. This weapon of mass destruction has brought the human race to the brink of an immense catastrophe.

None of this was foreseen by Einstein when he first proposed the simple formula equating energy to mass. He was thinking of the benign effect of light pressing on matter and that light is a substance and has inertial mass but no weight.

In the original special relativity paper, titled "On the Electrodynamics of Moving Bodies,"<sup>1</sup> Einstein pointed out that the relative motion of a magnet with respect to an electric conductor induces an electromotive force in the conductor, regardless of which of the two bodies is deemed to be at rest and which in motion. This clashed with Maxwell's electromagnetic field theory which predicted that, contrary to experiment, no induction should take place if the magnet is at rest in the laboratory. This obvious flaw of Maxwell's theory was eliminated by Einstein with the Lorentz transformations. In so doing he converted the electromagnetic field theory to the special theory of relativity. There is no mention of  $E=mc^2$  in Einstein's original relativity paper.<sup>1</sup>

The energy-mass equivalence was an afterthought which Einstein published a few months later, still in 1905. The second paper was only three pages long. Under the title "Does the Inertia of a Body Depend Upon Its Energy Content?" Einstein answered the question in the affirmative. His proof led to his historical statement:<sup>2</sup>

If a body gives off the energy  $E$  in the form of radiation, its mass diminishes by  $E/9 \times 10^{20}$ , the energy being measured in ergs, and the mass in grams.

This amounted to  $E=mc^2$ , where  $c$  is the velocity of light and  $m$  the inertial mass of the traveling energy. Einstein was not the first to suggest that mass and energy were convertible into each other. What was new was that Einstein provided a mathematical formula for treating the mass-energy conversion quantitatively. Field theoreticians later went further and described the immaterial energy traveling through space with the help of the Poynting vector. This was supposed to carry momentum and exert an impact force when colliding with solid matter and a recoil force when leaving solid matter. No other mechanism is available in field theory for producing the Lorentz force. All this led to the firm belief that energy and light could be transported from one place to another with the fixed velocity  $c$  and that the light substance possessed inertial mass.

The revolutionary aspect of the Maxwell-Einstein radiation processes was that the universe now consisted not only of ponderable matter but also of the additional substance of free energy which behaved like a mass bearing fluid. Matter and light both possessed inertial mass which obeyed Newton's second law of motion and momentum conserva-



tion, but light refused to behave like gravitational mass.

### Problems with the Magnetic Field

Our civilization has greatly benefited from the existence of electromagnetic radiation, particularly in the fields of optics and radio, television, and radar communications. All these applications rely essentially on the laws of electromagnetic induction. The inertial property of the traveling energy leads to radiation pressure. But this remains hidden in everyday experiments. It is only when slowly varying magnetic fields exert large forces, which are used to drive electric motors and similar machinery, that impact and recoil forces of field energy become noticeable. It is in connection with such electromechanical applications of the Maxwell-Einstein field theory that the formula  $E=mc^2$  has failed.

The first to prove the failure of  $E=mc^2$  was Professor Panos Pappas of the University of Athens, Greece.<sup>5</sup> Pappas set out to show, by experiment, that the Lorentz force of conventional field theory did not agree with the mechanical force experienced by part of a current loop. Unexpectedly, Pappas found that in his experiment  $E=mc^2$  was also violated. The author confirmed Pappas' experiment in his MIT laboratory and called it "the impulse pendulum experiment." A full description of it, complete with the theoretical analysis, will be found in the *Newtonian Electrodynamics* book.<sup>3</sup>

It was discovered that the measured momentum, electromagnetically imparted to the impulse pendulum, required, according to  $E=mc^2$ , the impact of 52.4 MJ of field energy. The energy stored in the capacitor bank and actually expended to drive the pendulum was, however, only 25.6 kJ. This meant  $E=mc^2$  overestimated the Maxwell field energy impinging on the pendulum by a factor of more than 2,000. Hence, Einstein's law failed to comply with experiment.

### Einstein's 1946 Essays on the Mass-Energy Equivalence

In 1946, that is after the Hiroshima and Nagasaki atomic bomb explosions, Einstein wrote two essays,<sup>6</sup> entitled " $E=mc^2$ " and "An Elementary Derivation of the Equivalence of Mass and Energy." While the whole world believed that it was his law and his relativity theory which caused the invention of atomic weapons, Einstein felt less certain about his contribution.

The first essay begins with a discussion of the swinging pendulum continuously exchanging potential and kinetic energy. He goes on to describe the generation of heat by friction and how this relates to potential and kinetic energy. Einstein points out that the mass increase which should occur when an object is heated is too small to be experimentally observable. The essay makes no attempt to derive  $E=mc^2$  from special relativity and the Lorentz transformations. Nor does the essay recognize the fact that the inertial mass of radiation is already an inherent property of Maxwell's field theory.

The second essay derives the mass-energy formula from three pre-relativistic laws, that is:

- (1) The law of conservation of momentum.
- (2) The pressure of radiation on an absorbing body.
- (3) The aberration of stellar light.

Again, the special theory of relativity is not mentioned. The conclusion that Einstein should have drawn, but failed to spell out, is that  $E=mc^2$  is not a result of special relativity,

but a consequence of Maxwell's field theory.

### $E=mc^2$ Violates Momentum Conservation

In his second essay Einstein claims he derived his mass-energy law from—amongst other laws—Newton's momentum conservation. However, Pappas' impulse pendulum experiment proves that  $E=mc^2$  violates classical momentum conservation. Einstein was not aware of this.

In all experiments of this kind, an electric conductor is placed into a magnetic field. When the conductor carries current, it will experience the Lorentz force of field theory. If the conductor is free to move, it will accelerate. Consider the case where the magnetic field is due to the discharge of an amount of energy  $E_c$  from a capacitor into an electric circuit. Assume the capacitor discharge current accelerates the conductor of mass  $m$  to the velocity  $v$  so that the conductor absorbed the measured momentum  $mv$ . This has to be provided by field energy momentum of electromagnetic mass  $m_e$ , traveling at the velocity  $c$ , colliding with the conductor and being arrested by it. Momentum conservation therefore requires

$$m v = m_e c. \quad (1)$$

According to field theory, the energy  $E$  striking the conductor should be

$$E_f = m_e c^2 = m v c. \quad (2)$$

This may now be compared with the energy that was stored in the capacitor. If Einstein's law turns out to be correct, we should find  $E_f/E_c \leq 1$ . Instead the impulse pendulum experiment furnished the following energy ratio:

$$E_f/E_c = 52.4 \times 10^6 / 25.6 \times 10^3 \approx 2,000.$$

Hence, Einstein's law failed to comply with experiment and we have to conclude that it does not agree with momentum conservation.

Railguns, which are electrodynamically similar to impulse pendulums, furnish many more instances of the failure of Einstein's energy law. The *Newtonian Electrodynamics* book shows a railgun example in which  $E_f/E_c \sim 24,000$ . Millions of induction motors are continuously in operation around the world. They all defy electromagnetic momentum conservation.<sup>7</sup>

### Conclusion

If the essence of the special theory of relativity is expressed by the Lorentz transformation added to Maxwell's field equations, then  $E=mc^2$  is not a consequence of Einstein's relativity theories. Einstein himself has shown that the energy law is inherent in pre-relativistic electromagnetism as formulated by Maxwell and his followers. The fundamental hypothesis of Maxwell's theory is the existence of the electromagnetic field which he and Faraday introduced in order to supersede the instantaneous action at a distance concept of the older Newtonian electrodynamics.<sup>3</sup> The first electrodynamic theory is primarily due to Ampere, F.E. Neumann, and Kirchhoff. It was of critical importance to the introduction of the electrical age, but it did not deal with electromagnetic radiation. It is in full harmony with Newton's laws of motion and gravitation and fully complies with momentum conservation. In the Newtonian electrodynamics, ener-



gy is not considered to be a substance which can fly through space, nor can it be associated with inertial mass.

Where does this leave us with respect to the explosion of atomic bombs? There is no doubt that enormous amounts of energy are stored in the bonds between nuclear particles. Manipulation of these bonds is the cause of nuclear explosions. No evidence has been quoted in this talk which indicates that mass in nuclear reactions cannot be converted to non-material energy. If nature allows this conversion, then some law like Einstein's may correctly predict the conversion quantities. There remains much to be discovered in the field of nuclear physics.

It was a guess when Einstein claimed that the inertia of a body depended on its energy content and that the energy could be radiated away. The experiments mentioned before question the validity of Einstein's guess.

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#### About the Author

Dr. Graneau devoted thirty years of his career to fundamental issues of electromagnetism and inertia. He is the author of over 100 published papers and four books.

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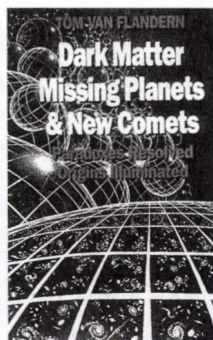
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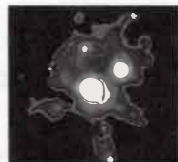
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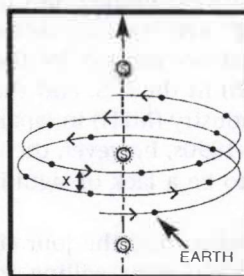
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# Cold Fusion: What's New, What's Not

Steven B. Krivit\*

Eleven years have passed since Eugene Mallove and Jed Rothwell wrote "A Cold Fusion Primer." It's now 2005. What's new? What's not? This article provides a brief summary to answer these questions.

Sadly, one of the greatest changes is the loss of Eugene Mallove, who was brutally murdered in May 2004. At the time of this writing nearly one year later, the mystery is unsolved and no suspects are named.

Looking back on the perspective from 1994, it seems as though cold fusion research lost significant momentum in the latter half of the last decade, though a revival now seems possible. In 1994, the research initiatives funded by the Electric Power Research Institute (EPRI) in the U.S. and the Ministry of International Trade and Industry (MITI) in Japan inspired strong optimism. By the mid-1990s, however, these programs folded, for what appeared to be a lack of significant progress.

The *Journal of Electroanalytical Chemistry* and the journal *Fusion Technology*, which had previously been willing to accept cold fusion papers, both had a change in policy and stopped accepting cold fusion papers. Few journals have taken their place. The *Japanese Journal of Applied Physics* has been a notable exception.

The predictions in the Mallove and Rothwell article seemed realistic at the time, based on the progress they saw. With the solid but slow progress in 1994, they could not have foreseen, or imagined, the cessation of funding and the closing doors of more journals. Alas, 2000 has come and gone, without the predicted cold fusion-powered automobile.

The hot fusion prediction was wrong also. As Mallove and Rothwell reported, that industry was predicting to begin operation of the tokamak to end all tokamaks, the International Thermonuclear Experimental Reactor (ITER) by 2005. Ground has not even broken.

Despite the optimism of cold fusion proponents and despite the cynical pessimism of others, cold fusion research has held its ground, and even gained a bit. The facts of cold fusion science have remained the same. Helium has persistently appeared as the dominant by-product. Neutrons have been observed, but at very low levels. The remaining observations of this nuclear reaction still demonstrate an effect that appears to be environmentally friendly and safe for humans. And, yes, it still does sound too good to be true. However, the facts are readily available for sincere skeptics. Several books and reports by Beaudette, Krivit and Winocur, and Rothwell have been published in recent years which attest to these facts.

In 2004, the U.S. Department of Energy decided to take a second look at cold fusion. Unlike the authors of recent books on this subject, the official conclusion of the DOE review stated that there was nothing new in the field since

1989. In the very same document, it was shown that about one-third of the review panel members agreed there are anomalous effects, and half of the reviewers found the evidence for excess power compelling. The conclusion written by the DOE does not match the general perceptions of the reviewers and it remains somewhat of a mystery as to why the DOE even bothered to perform this review in the first place.

Regardless, despite the fact that the DOE has not decided to fund cold fusion research at the moment, reports from qualified sources indicate that the review has brought significant attention from private industry and investors to the field. While no details have been made available, rumors indicate that private industry has decided to take a bet on cold fusion, while the DOE remains on the sidelines.

Recent credibility and recognition in the field likely is due, in part, to the innovative work in Japan. Yasuhiro Iwamura of Mitsubishi Heavy Industries designed a flawless experiment that demonstrated 100% reproducibility. His experiment was replicated with a series of experiments at Osaka University—also achieving 100% reproducibility.

The future of cold fusion is still clearly uncertain and any new predictions would most likely turn out wrong. The only prediction that is reasonable is that the window of opportunity for cold fusion will close within the next decade or two. With rare exceptions, like the relatively youthful Iwamura, the most experienced cold fusion researchers are in the later years of their life.

Many of those who started on cold fusion research in 1989 did so because they had the freedom of retirement, the wisdom of years, and the array of skills that comes only with decades of experience in science. Their knowledge, so far, has not been widely passed down to younger generations of future scientists. Whatever inevitable circumstances arise for them, be they time and nature, or acts of man, society will be losing many pioneering scientists in the coming decades. The only question that remains is whether they will have the time and the opportunity to extract the secrets of cold fusion.

## About the Author

Steven B. Krivit is the coauthor of *The Rebirth of Cold Fusion* and the senior editor for *New Energy Times*, a newsletter and



website specializing in cold fusion news and educational information (online at [www.newenergytimes.com](http://www.newenergytimes.com)). He is one of the world's leading experts on the field of cold fusion; he regularly communicates with over 70 researchers from 11 nations.

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# Dr. Thomas Valone's Presentation on the Future of Energy to Shelton, CT Chapter of the World Future Society

S. Pal Asija

On March 12, Dr. Thomas Valone, founder and president of Integrity Research Institute (IRI), a Washington, D.C. Think Tank dedicated to future energy solutions, addressed the Shelton, Connecticut chapter (now in its fifth year) of the World Future Society; the chapter meets on the second Saturday of each month from 12:00 to 3:00 p.m.

Dr. Valone mesmerized the audience with his masterful presentation and handled their questions with exceptional and exemplary skill and felicity. In spite of over a foot of snow, about twenty futurists, inventors, intellectuals, and energy professionals attended, among them my heart surgeon Dr. Cary Passik and my CPA Bishop Bruce Stratford. So I was covered both physically and spiritually! In his over one hour Powerpoint presentation, "Future Energy Technologies," Dr. Valone covered the following topics in considerable depth:

1. Tesla technology and how IRI is trying to resurrect his inventions, like wireless transmission and augmentation of power as it propagates through the ionosphere. The healing power of the Tesla coil and the use of Earth's ELF (Extremely Low Frequencies) for therapeutic purposes in such devices as an electric chair (no relationship to the electric chair used in electrocution of prisoners on death row).
2. Exciting new concepts in magnetic motors, generators, and engines such as the Perendev and Brady motors, and the patented homopolar system (US 6,822,361 B1) by Russian inventors Sergi Godin and Vladimir Roschin. Valone graciously thanked his patent attorney (yours truly) for assistance with the patent. Dr. Valone himself did some pioneering work in homopolar generators and has authored a book to prove it. In addition to the *Homopolar Handbook*, Dr. Valone is also the author of *Patents and the Patent Process: An Introduction for Inventors* and *Bioelectromagnetic Healing: A Rationale for Its Use*, both published by IRI.
3. Advanced nuclear energy technologies, including a nuclear betavoltaic battery as well as a very innovative nuclear waste remediation technology which solves two problems in one by substantially deactivating and neutralizing radioactive waste while at the same time extracting energy from it.
4. Zero-point energy (ZPE), Casimir force, and space propulsion and how this research relates to secret United States government projects operating under "Black Budget"—officially known as USAP (Unacknowledged Special Access Projects). Some jaws fell in disbelief when Dr. Valone asserted and exclaimed that ZPE in space due to quantum fluctuations is more than  $10^{24}$  joules per cubic meter and even as much as  $10^{58}$  joules per cubic meter.

Dr. Valone, in response to audience questions, discussed other potential energy-related technologies, such as how spray on solar cells are five times more efficient than conventional silicon based solar cells.

He also answered questions about the mysterious triangu-

lar flying objects seen by many credible professionals. The triangular aircraft has been observed with capabilities and flight characteristics unknown to man, such as high-speed right angle turns and hovering below stall speed.

I highly recommend an e-subscription to IRI's *Future Energy eNews*, free at [www.IntegrityResearchInstitute.org](http://www.IntegrityResearchInstitute.org). This timely electronic newsletter is useful for all interested in the new energy field.

If you are interested in exploring the future of other subjects or in locating the nearest chapter of the World Future Society, then you will find [www.wfs.org](http://www.wfs.org) indispensable. Its European counterpart, the World Future Studies Federation, is online at [www.wfsf.org](http://www.wfsf.org). For a schedule, breadth, variety, and range of topics for the Shelton, Connecticut chapter, point your browser to [www.ourpal.com](http://www.ourpal.com) and click on "Events."

Meetings of the Shelton chapter are open to non-members as well. An RSVP is highly recommended to assist in planning. A typical meeting begins with self-introductions over complimentary light lunch graciously hosted by Teresa Asija. Some people tease me by unabashedly, declaring that they come not for my presentation but for my wife's hospitality, which you have to experience firsthand to appreciate what they mean. The self-introductions comprise three parts: a) name and affiliation, b) state something unusual, exceptional, unique, weird about yourself, and c) provide a brief answer to the topic focus question, which for Dr. Valone's presentation on future energy technologies was, "How can we benefit from the infinite zero-point energy in the vast empty space all around us?" The self-introductions are followed by the main presenter, with a generous Q&A session thereafter.

I think the World Future Society will serve its members well by inviting Dr. Thomas Valone as a plenary or keynote luncheon speaker to an upcoming annual convention; this year's will be held at the Chicago Hilton and Towers from July 29-31, 2005. WFS annual meetings are very well-attended and give you the biggest bang for your educational dollar, not to mention fun and tours. If you are a futurist who believes in advance planning, then think Toronto Sheraton for 2006, Minneapolis Hilton for 2007, and Washington (D.C.) Hilton for 2008.

Dr. Valone is personally committed to helping establish integrity in scientific research, primarily regarding the physics of energy, whether it is in the technical, human health, or environmental area. He also organizes and presides over the Conference on Future Energy. His interests and activities are seemingly endless with matching energy levels. We are grateful to him for gracing our meeting with his presence and presentation.

Since IRI is a 501(c)3 non-profit organization, your donations are tax-deductible. Dr. Valone can be reached by snail mail at 1220 L Street NW, Suite 100-232, Washington, D.C. 20005, or by phone: 1-202-452-7674, fax: 1-301-513-5728, or e-mail: [iri@erols.com](mailto:iri@erols.com).



# Response to the DOE 2004 Review of Cold Fusion Research

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During 2004, the Office of Science of the U.S. Department of Energy (DOE/OS) initiated and completed a peer-review of the field in science known as cold fusion research (CFR). The DOE/OS selected eighteen Reviewers for their expertise in the relevant scientific specialties. Remaining largely anonymous, they studied a collection of papers about the field selected and prepared by several of the scientists who have been active in CFR for the past sixteen years. Those scientists also presented selected accomplishments to some of the Reviewers during a one day meeting. The following three questions (paraphrased) were asked of the Reviewers: (1) Is there evidence of low-energy-nuclear-reactions (LENR), (2) do such reactions really occur, and (3) should research efforts be continued?

The DOE/OS published its final Report<sup>1</sup> on December 1, 2004. It also provided the eighteen individual reviews to the CF scientists, who had originally requested the review in a meeting with the OS in November 2003. Those researchers released the Reviews to which I, herewith, choose to respond in the hope that I might bring to them some historical perspective. My Response is written without knowledge of the identity of the numbered Reviewers.

The DOE/OS accomplished the best peer-review evaluation that was possible under the difficult circumstances of CFR's place in the professional community. Nevertheless, it is instructive to ask: What if the editor of an archival journal were to use a similar peer-review procedure by choosing reviewers who were not active in the field, did not know of its key experiments, and were ignorant of its literature? Would that not invite the editor's dismissal? George H. Miley knows something about peer-review.<sup>2</sup> A hot and cold fusion scientist, he was for many of the past fifteen years editor of three professional journals. Once, criticized by his editorial board for sending cold fusion research papers only to other cold fusion scientists for review, he pointed out that hot fusion papers are sent to hot fusion researchers for review. This is done because that is where one finds the experts. The Office of Science did not have a choice in this matter given the pariah status of the field. The peer-review work necessarily had to be done by scientists outside the field of CFR who, unavoidably, were unfamiliar with its technical development, leading scientists, significant experiments, and principal papers.

The eighteen reviews reveal two aspects of the field that are sufficiently confusing and pervasive that they need some treatment: (1) the concern with the lack of reproducibility (repeatability) of experiments, and (2) the tendency to dismiss the excess heat measurements in favor of counting energetic particles. The first calls for a review of various methodologies to show that a protocol lacking reproducibility is regularly used in accepted experimental science.

The second concern is equally difficult because, unfortunately, some measurements of excess heat threaten the

canon of nuclear science. In fifteen years and hundreds of experiments, no measurement of heat, no matter how well done, can be accepted, or even allowed, as valid by the nuclear physics community. Reviewer 7: "This single-minded conclusion has been pushed ever since, even though. . . 'The excess heat effect itself is consistent neither with a conventional D + D fusion reaction mechanism, nor with any other nuclear reaction mechanism that appears in textbooks or in the mainstream nuclear physics literature.'"<sup>3</sup> This implicit defense of the canon makes its appearance in discourse with physicists as an unstated assumption that mankind does not know how to measure heat or heat flow. By the way, from that same Reviewer, one gets an identical response to the Iwamura measurement of transmutation: "From a nuclear physics perspective, such conclusions are not to be believed."<sup>4</sup> Apparently, mankind also does not know how to measure transmutation. This refusal is based on a religious attitude of disbelief—one does not see a request to examine and review the experiment. Data is waved off if it violates the canon of nuclear physics. As a consequence, the pariah status of CFR within the science community lasted from May 1, 1989 to December 1, 2004—a total of 5,693 days in the wilderness. DOE/OS offered to the CFR scientists a review process ordinarily used by editors to judge individual papers for publication, which, in spite of this oddity, managed to accomplish its peculiar task adequately.

The Office of Science Report of its Review of LENR found that half the Reviewers considered the evidence for excess heat compelling. From the Report: "Evaluations by the reviewers ranged from: 1) evidence for excess power is compelling, to 2) there is no convincing evidence that excess power is produced when integrated over the life of an experiment. The reviewers were split approximately evenly on this topic."<sup>5</sup> The finding of this new phenomenon, item (1), if confirmed, would constitute a scientific field whose purpose would be to bring understanding as to its source, presumably nuclear. The CFR community recognizes the discharge of heat energy as the *presenting symptom* of a low-energy nuclear reaction (LENR). Taken all in all, the Review adds up to about as much as might be expected under the circumstances. As Peter Hagelstein declared in the journal *Science's* commentary on the Review, "In the end, the reviewers said that a study should be funded if a proposal is strong. You can't ask for much more than that."<sup>6</sup>

If we look a little more closely at the Review by scanning the individual Reviewer reports, there is a considerable level of confusion as to how the field of cold fusion research began, and how its several parts now relate to one another. For example, Reviewer 10 says, "At the time of the [DOE/ERAB 1989] report, these [heat generating] fusion products were assumed to follow the usual branching ratio of the d-d reaction, so the implication was that production



of neutrons or tritium would be investigated.”<sup>7</sup> Among the CFR scientists in 1988-89, there was in fact no assumption of a textbook d-d reaction for the source of the claimed excess heat. However, most critical physicists wrongly assumed a necessity for copious neutron emission per watt.

As a further example of this confusion, Reviewer 15: “In fact it seems that all of the workers in this field accept the P-F results as true and yet the review work shows that no effect is observed until the loading of the foils [D/Pd] is greater than 0.95. They also told us that it is extremely difficult to get the foil loading up to 0.95. P-F did no special work to load their foils and in fact based on the SRI work it would be hard to believe that their loading was above 0.9, too low to have any effects.”<sup>8</sup> F&P obtained excess heat by driving their experiment hard for ten weeks.

In the spring of 1989, others ran five-week experiments based upon diffusion-time calculations and obtained null results. It was later that experimental inquiry led to understanding and measuring the loading requirement.<sup>9</sup> Reviewer 18 confuses the two CF reactions involved, “However, the proposed rate of fusion reactions would have to be so large that lethal numbers of neutrons would have to be emitted from the  $D+D \rightarrow He3+n$  reaction. The second set of experiments claimed to observe neutrons stemming from this reaction, but at a rate that would indicate a much smaller energy release.”<sup>10</sup> We note here the opinion offered by Reviewer 8, “The two most difficult things any scientist can be asked to do are trace analysis/mass balance and calorimetry.”<sup>11</sup> It takes many months of study to develop expertise in calorimetry.

A careful reconsideration of what was announced and claimed on March 23, 1989 (89/3) at the University of Utah by Martin Fleischmann and Stanley Pons (F&P) will serve to give us a reference benchmark.<sup>12</sup> By assessing the Press Conference transcript, the University’s press release, and the *Journal of Electroanalytical Chemistry (JEAC)* Preliminary Note<sup>13</sup> of April 10, a benchmark can be set in place as follows.<sup>14</sup>

**First claim, 89/3:** A sustained deuterium-deuterium fusion reaction producing neutron radiation is claimed by F&P for their electrochemical cell operation. Fleischmann also stated that the measured neutron level indicated a fusion reaction rate that was a factor of a billion times too low ( $10E-9$ ) to account for the simultaneous claim of generated heat energy.<sup>15</sup>

By pretending that they were experimental physicists during a few weeks prior to the announcement, the two chemists made mistakes in their attempt to measure neutron radiation. They erred badly collecting data, and their errors were quickly discovered and emphasized.

During 1988-89, S.E. Jones, a physicist at Brigham Young University, reported the detection of neutrons emitted from an electrolytic solution as a sign of room-temperature, d-d fusion reactions. He has continued these investigations, extending them to deuterated foils, and the Reviewers were provided with one of his most recent publications. Reviewer 6 commented on the low reaction rate: “That is hardly sufficient to provide a significant source of energy.”<sup>16</sup> Reviewer 14 noted of this work, “A second class of experiments seeks to find evidence of low energy nuclear reactions, though not necessarily at the rate required to produce significant excess energy.”<sup>17</sup> In the same way, the field of CFR views this evi-

dence of low-level, d-d fusion reactions as a scientific curiosity, one quite separate from the excess heat producing phenomenon.

**Second claim, 89/3:** The F&P experiment claims to demonstrate a source of heat energy heretofore unknown to science. The event is similar to Pierre Curie’s claim in 1903 of the heat energy of radium, which can melt its own weight in ice each hour without suffering apparent change. Each claim defied all the prior experience of science.

A calorimeter especially suited to the requirements of the experiment is built into the F&P cell design.<sup>18</sup> The Dewar flask has a silvered neck to hide changes in the electrolyte level, and it requires a hard vacuum to perform properly. By immersing the flask in a bath of water held at a precise lower temperature, 95% of the cathode’s heat passes to the bath by radiation. This thermally wideband calorimeter enables a fast rise in temperature—a parameter change known to promote excess heat generation—and, because the heat also departs the cathode fast (by radiation), the temperature can fall rapidly. Additionally, its isoperibolic operation permits a large range of power capacity. Its absolute accuracy is shown to be  $\pm 2$  mW, about an order of magnitude improvement over the typical laboratory calorimeter. Considering all, the F&P cell *cum* calorimeter constitute a most desirable instrument for the purpose.

In their Preliminary Note of April 10, 1989, F&P claimed that with cell currents of 8, 64, 572 mA, they measured the generation of 0.036, 0.493, 3.02 Watts of excess heat power respectively.<sup>19</sup> In their seminal paper of July 1990, the experimental run shows a temperature burst phenomenon at day 65 that lasts for 48 hours. The measured energy in the burst is 2 MJ or about 1/2 kWh, an amount 20 equal to the energy stored in a 60 ampere-hour automobile battery. F&P asserted that given this amount of energy generated over a two day period, a source other than nuclear was “inconceivable.”

Measuring the total energy of the experiment from beginning to end, as suggested by a number of the Reviewers, would make the excess energy analysis less, rather than more, meaningful. Both approaches require a thorough search for artifacts that might provide energy from chemical or mechanical storage, or its inference from data reduction procedures. But including the whole experiment raises a confounding consideration. The question of the efficiency of the experiment as an excess power generator—as a source of supply—now must be included in the evaluation. The electrolytic cell might be, and in some experiments appears to be, an especially inefficient supply reactor, especially when compared with newer experiments. After all, some electrolytic cell experiments generate excess heat after the excitation current is turned off—the implication being that the electrolytic action only provides a start-up function.<sup>21</sup> To answer the scientific question, “Is there a new phenomenon of excess heat,” we should turn to the power-flow, time-slice analysis as the most rewarding analytical approach to data reduction with the electrolytic cell.

Reviewer 7 observes that, “there have been few attempts to search for evidence of unknown, non-nuclear processes, either chemical or physical, to explain the results of cold fusion experiments.”<sup>22</sup> Searching and coming up with null results is not the sort of activity that leads to published papers. The notion that 3.05 Watts (89/3), or 2 MJ in 48



hours (90/7), could come from some stored mechanical or chemical source within the cell does seem absurd. Certainly, critics have a duty to try to elucidate possible storage mechanisms as disturbing artifacts, but they must work with actual experimental results, as above. In the opinion of those working in the field for sixteen years, that amount of energy can only come from a nuclear source; there is no other credible hypothesis.

The claim that excess heat has been observed is, and was from the beginning, based upon superior calorimetry and excellent data reduction. Considering themselves experts at both calorimetry and electrochemistry, and having worked with the experiment for four years at the time of the announcement, their seminal paper (90/7) confirms that F&P were certain of their energy measurements. It is my observation that their subsequent publications over the next six years support their initial claim.

Excess heat measurements are the starting point of the cold fusion episode. Note the confusion that results when Reviewer 7 starts elsewhere: "The main problem with this direct-heat scenario is symptomatic in many ways of the entire history of cold fusion. One begins by proposing a very unusual new mechanism, namely  $d + d$  fusion at room temperature, that some chemists and solid-state scientists can accept but most nuclear specialists cannot."<sup>23</sup> This is a wrong reading of early events. No one began by "proposing a very unusual new mechanism." One begins at the beginning with the discovery by measurement of a heat energy generation phenomenon previously unknown to science. From that beginning, analysis of the experiment proceeds to the hypothesis that the cell operation contains a source of energy from an unknown nuclear reaction. Science, after several decades, found the source of Pierre Curie's heat, and now it must find the source of F&P's heat.

**Third claim, 89/3:** No dangerous radiation accompanies the generation of excess heat. F&P apparently were not harmed in four years of experimentation. When testing for dangerous levels of radiation or radioactivity, they found none.

Some Reviewers seemed to work with an unstated assumption that a patched-up, textbook  $d-d$  fusion reaction might provide the energy source, rather than an utterly new reaction. Reviewer 12, for example, wonders: "The most puzzling part for nuclear theory is the lack of neutrons commensurate with the heat production and the complete reversal of the ratio for the reaction channels. This is still the crucial and seemingly insurmountable physics problem that needs to be resolved."<sup>24</sup>

A larger view is taken by Reviewer 6, who points out that to begin a review of "cold fusion" it is useful to remind oneself of the quote by Dr. Gordon Baym from his article in *Phys. Rev. Lett.*, 63, 191(1989): "We are searching for new experimental phenomena in an area in which theory must be supported by consistent, systematic data. Any search for 'anomalous phenomena' is, in its early stages an experimentally, not theoretically driven field. It is necessary to stay as close as possible to conventional physics for as long as one can hold out, and only when driven up the wall should theorists invoke new physics."<sup>25</sup> Here, in this third claim, F&P met that "wall." They knew their heat measurements were valid, and that the amount of energy was so great that only a nuclear source could deliver it. They had been living with

this "wall" since February of 1985. In March 1989—their working secret now revealed locally—they were obliged to anticipate the community's reaction by announcing their claim to the world, even though their seminal paper explaining their work was still sixteen months in the future.

There was much misunderstanding in the DOE/ERAB 1989 report on CFR. Its composition never allowed logical space for steady-state or burst heat evidence of an unknown, high-level reaction that needed to be studied further. It did allow that the 89/3 claim number one, low-level  $d-d$  fusion at an unusually high rate, should be studied further. Reviewer 10 offers: "Another problem with the proposal of  $4\text{He}$  as the major product, as is recognized in the review, is that the proposed  $D-D$  branching ratio must be assumed to be very different from that in previous studies of deuterium fusion and the absence of gamma rays, which would accompany this route, must be explained."<sup>26</sup> Exactly. Excess heat and the helium created in its production need to be explained. A new kind of reaction waits to be discovered.

**Fourth claim, 89/3:** Hypothesis: the heat energy source is an unknown nuclear reaction. I offer two quotes from F&P. The first is of March 22, 1989 (their manuscript date): "It is inconceivable that this could be due to anything but nuclear processes."<sup>27</sup> The second is of July 1990 when they repeated the hypothesis that, "...the bulk of the energy release is due to an hitherto unknown nuclear process or processes (presumably again due to deuterons)."<sup>28</sup> Those statements still stand firm in the CFR literature. Given the size of the heat measurements, their conclusion is the only reasonable hypothesis. So, the heat energy emerges from a nuclear reaction presently unknown to science. No detail is offered concerning the type of reaction it might be or what products (nuclear ash) it necessarily must produce.

For example, in the mid-nineties there was concern that the palladium was being consumed by the unknown reaction, and relief was offered by an experimenter in Minsk, Belarus, who found that niobium could be substituted for palladium, and noted that large ore reserves for niobium exist.<sup>29</sup> See also the Iwamura experiment where deuterons seem to form alpha particles that then enter large nuclei. Wilson *et al.*, in their July 1992 critique, found no calorimeter artifact to obliterate F&P's two MJ energy burst. (That article is worth study, along with the F&P rebuttal.<sup>30</sup>) We can see here that the field of CFR science does not allow a chemical, mechanical, foundry, or data reduction (statistical) explanation to satisfy the excess heat energy measurement.

Reviewer 2 avers, "The excess heat reported remains unexplained. However, there is no evidence for this being a nuclear physics phenomenon."<sup>31</sup> Curie's heat energy from radium was quickly and correctly hypothesized as having the same source as radioactivity. X-Z. Li, physicist at Tsinghua U., Beijing, declares, "...the usual nuclear technology for neutron or gamma radiation is no longer applicable to detect this low-energy sub-[Coulomb]-barrier resonance. The calorimetric technology in chemistry turns out to be the better choice because the energy released in any nuclear reaction is always there."<sup>32</sup> The hypothesis, of course, comes from elimination of other possibilities for the source of the energy—a logical conclusion given the data. The lack of particle-type evidence is a road block for the nuclear physicists. The continuing refusal of some scientists to see heat as a strong indicator of nuclear activity will not



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stand upright much longer. We are left with the wondrous heat of the F&P experiment and its freedom from obvious and dangerous radiation. The only proper course was to search for a new reaction channel beginning at the announcement of 89/3.

Revolutionary change can come from outside a specialty, as is explained by W.I.B. Beveridge in *The Art of Scientific Investigation*:

Thus in subjects in which knowledge is still growing... all the advantage is with the expert, but where knowledge is no longer growing and the field has been worked out, a revolutionary new approach is required and this is more likely to come from the outsider. The scepticism with which the experts nearly always greet these revolutionary ideas confirms that the available knowledge has been a handicap.<sup>33</sup>

The reviews demonstrate how some Reviewers judge CFR evidence by its fit, or lack of fit, to the nuclear canon. If it does not fit, it is rejected. If the evidence is rejected, its use to confirm the phenomenon of excess heat is not allowed. "Available knowledge" is thus shown as a substantial inhibition to discovery.

CFR investigations circumvented the lack of particle evidence in the F&P experiment by taking an innovative step. They turned to look broadly, outside CFR, for anomalies in nuclear experiments, and found some to pursue, such as the Kasagi<sup>34</sup> experiment. Digging up anomalies in nuclear experiments proved fruitful.

In summary, we can see from this overview of the four original claims that there are two nuclear reactions occurring within the cathode of the electrolytic cell, one at a high-level producing well-measured heat, and the other at a low-level producing neutrons. The former is an unknown (LENR) reaction channel; the latter is a seemingly conventional d-d fusion reaction channel, but lattice-mediated (LENR) to provide a perceptible rate at room temperature.

Concern for experimental reproducibility (repeatability) sometimes overshadows experimental results in cold fusion research, both among its practitioners and its critics. Dr. Franco Scaramuzzi, an esteemed hot fusion physicist who practiced cold fusion research for fourteen years, expresses this concern, "A well known physicist was asked what he thought of CF. His answer was that it was not good science, because of the lack of reproducible experiments. I wrote to him presenting the following arguments: a) I agree that reproducibility is a 'must' in experimental research; b) however, a new field, at its beginning, is often characterized by a lack of reproducibility, and it is the task of the scientists operating in the field to understand what is going on, in order to pursue reproducibility; c) this has been done in the case of CF, making meaningful, even though slow, progress

(I sent him a paper of mine in which I discussed this problem). My letter did not produce any effect, in the sense that he did not change his mind, and went on demanding reproducibility, as if it were an intrinsic characteristic of research and not something that has to be pursued."<sup>35</sup> The Reviewer group also found the lack of reproducibility to be a major concern. Reviewer 14: "The lack of reproducibility continues to be a serious problem. None of the important phenomena can be duplicated reliably. This has made it impossible to obtain a quantitative understanding of what is taking place."<sup>36</sup> Reviewer 18: "Although much systematic work has been done on the materials properties that produce a successful cell, the reproducibility is still, at best, only 50%."<sup>37</sup>

This matter is seen as more than an inconvenience: Does not a lack of reproducibility tag the field as less than properly scientific? Well, in some specialties of science, it does not. For example, in cosmology, there are no experiments whatsoever, let alone repeatable ones (although Earth-bound experiments do try to partially simulate cosmic events). Nevertheless, cosmology is considered just as scientific an undertaking as other specialties that directly utilize experiments. How, then, in an observational science, are the results to be validated? They are validated, simply enough, by experts who conduct a thorough step-by-step review of the data gathering (measurement) process and find therein no error of procedure.

Furthermore, besides placing the specialties of chemistry-physics (with their wholly repeatable experiments) as one category side by side with cosmology as a second category for comparison of their discovery protocols, we can proceed to identify an intermediate position between the two, one that can be occupied by a biological category. We look at the report in *Nature*, Vol. 385, 23 February 1997, page 810, of the cloning of a mammal from an adult cell to produce the sheep "Dolly."<sup>38</sup> This biological experiment, as reported, was eminently not reproducible (repeatable). While the protocol was of the experimental sciences (biology), the application was without repeatability. Of 227 nuclear-transfer starts, in this case, only one live birth resulted—one success and 226 failures in an experimental field.<sup>39</sup> The failed ones were discarded, and the successful one was presented in *Nature* as an accomplishment of science. Reproducibility (repeatability) is not a requirement for scientific respectability. (Also, we note here, the experimental failures may not have diagnostic value.) This is the case with "Dolly" and with CFR, which together occupy the protocol space between cosmology and chemistry-physics.

The explanation of this diversity of protocol is that if it is not possible to reproduce the required initial conditions of an experiment, then it is not possible to reproduce the experiment. The "Dolly" experiment uses biological cells that are not exact duplicates of one another to initiate each



experiment. The CFR experiment uses metallic cathodes from the foundry that are not duplicates of one another at the atomic-lattice level. In both cases, the exactness of these central elements, or some important aspect of them, establishes the experiment's initial conditions. As mankind does not know how to duplicate these initial conditions, so it is not reasonable to expect to be able to repeat the experiments. Of course, it can still be reasonable to expect to repeat the significant experimental outcomes—to once again clone another sheep, or to once again generate excess heat.

The DOE/ERAB (1989) report recognized this methodology in its preamble, "even a single, short but valid cold fusion period would be revolutionary."<sup>40</sup>

When the limits of current knowledge or technology make an experiment intrinsically not replicable (repeatable), then each experimental run is a new experiment—each is a *solitary* experiment. The protocol for these experiments might require outright discard for those that fail, and (presumably modest) acclaim for those that have an interesting result. Such is the case with CFR. The EPRI/NSF conference in October of 1989, for example, had as its original plan to bring together those experimentalists who had achieved interesting results—apparent excess heat—to compare techniques with one another so as to improve the experiment's design. Those others, who had obtained no interesting result, were welcome, but were not invited, because, presumably, they had little to offer. Science properly follows this protocol when experiments are not repeatable. Progress advances by successful reproduction of the interesting result in similar, though not identical, experiments, and by the meticulous review of experts.<sup>41</sup>

This lack of appreciation of the appropriate protocol by the larger scientific community was exhibited on October 26, 1989, by *Nature* at the end of an editorial about CFR: "Critics, on the other hand, maintain that if you are allowed to keep positive results and throw away the rest you can never be proved wrong: it becomes, as one skeptic put it, religion, not science."<sup>42</sup> This misunderstanding of protocol delayed CFR from enjoying the early attention it deserved. Fortunately, some of the DOE 2004 Reviewers understand this protocol. Reviewer 8 ventures, ". . . not all experiments are created equal. It is unscientific to give all experiments equal weight."<sup>43</sup> Reviewer 12 offers, "We should look at the best available experiments in order to get more information on whether there is some new physics involved."<sup>44</sup> Reviewer 13: "In the current state of the field, finding nothing in a given experiment teaches us nothing. . . ."<sup>45</sup>

Several Reviewers did not recognize this entirely proper methodology. Reviewer 1 asserts that, "In my view the references are also culled to present a one-sided view of the current state of experimental results." And further, "It has been characterized by a large number of positive but internally inconsistent results, plus an even larger number of negative results refuting many of the claims."<sup>46</sup> But, where each experiment is a solitary experiment, failed experiments refute nothing, as with "Dolly." Further, from Reviewer 5: "In 'New Physical Effects in Metal Deuterides' by Hagelstein *et al.* there are 130 references and only two of them are not directly from favorable CF literature. This illustrates the rather narrow focus of these researchers."<sup>47</sup> Here, the word, "favorable," is used to establish an illicit protocol. The CFR literature is where the important references are and ought to

be. And, from Reviewer 10, "Even with all of the careful work that has been done on electrochemical cells and calorimetry, the system is still not under experimental control, in the sense that one knows exactly the materials needed and the operating conditions to get the same results, even semiquantitatively, every time."<sup>48</sup> Experimental control is not yet available in CFR as is the case with other fields of *accepted science*.

For CFR to achieve reproducibility, experiments must be found that are insensitive to the variations in cathode structure. Progress has been made in this direction by several experimenters moving in the direction of operating at an elevated temperature,<sup>49</sup> using thin films, maintaining a longitudinal electric field in the cathode,<sup>50</sup> and by depositing the palladium on a cathode substrate from the electrolyte.<sup>51</sup> Presumably, such progress will continue. One should also note that, when doing experimental work in a field where initial conditions cannot be replicated, neither the experimenter nor the critic have warrant for complaint—you work with what you have.

I am pleased to note that only Reviewer 13 mentioned the word pathological: "The proponents' assertion that there is reproducibility of 50% (or may be even less) of experimental attempts indicate at least some excess heat, never mind how much or when it occurs is frustrating to the objective scientist and has some of the characteristics of 'pathological science.'" This is a far cry from September 1989 when a physicist lectured the faculty of the University of Utah to explain that F&P were offering only pseudoscience, the pathological science of Irving Langmuir.<sup>52</sup> In his lecture, that physicist overlooked four scientific conditions Langmuir set forth as definitive of a pathological claim. Let me juxtapose Langmuir's requirements with the 89/3 claims: (1) Output is constant with increasing input, but F&P's paper of April 10, 1989, claims their output excess heat increases with increasing current; (2) The effect is close to the limits of detectability, but F&P measure hundreds of mW with a calorimeter good to 2 mW; (3) There are claims of great accuracy, but F&P make no claim of great accuracy; (4) Fantastical theories are proposed, but F&P propose only a presently unknown nuclear channel. Langmuir says nothing about reproducibility. Perhaps, with this DOE 2004 Report, as published, the field of CFR is now free of pathological criticism.

In their analysis of CFR, I am sorry to note, three Reviewers referred substantively to the necessity, in CFR, for a "miracle." Reviewer 6: "Certainly the weight of the evidence present thus far is not strong enough to overcome the three miracle requirement." And continuing, "This theory [Hagelstein] was apparently developed to explain Huizenga's miracle number 3, concealed nuclear products."<sup>53</sup> Reviewer 17: "If the experimental results of significant energy release in electrolytic cells were correct and the energy release were due to nuclear fusion, the theory would need to explain not one, but two 'miracles.'"<sup>54</sup> And Reviewer 18: "As to the second miracle, all experiments . . ."<sup>55</sup> What can one say other than that such terminology should be avoided. Not only is it unscientific, but in this case also anti-intellectual, not to mention condescending. The usage stems from a 1992-93 book<sup>56</sup> that mistakenly ignored the significance of well-measured heat energy. Its author looked, instead, for a nuclear reaction that was some sort of paste-up variation of the known d-d fusion reaction. As it failed to give consider-



ation to valid heat measurements, so it needed "miracles."

While the quest for a source is not yet answered, the CFR literature has at least two suggestions to indicate a more appropriate kind of exploration than that suggested by "miracles." (1) P.L. Hagelstein, MIT, has written that a strong, uniform, optical phonon field [The cathode of an electrolytic cell is thought to develop a strong, optical phonon field because of the electronic and chemical reactions at its surface interface.] might impart a considerable angular momentum to two deuterium nuclei (in a compact state, almost touching) thus preventing them from fusing,<sup>57</sup> and thereby opening the way for a different, and maybe slower, kind of reaction between them. (2) X.-Z. Li, Tsinghua University, has written that a combined resonance of the Coulomb barrier and the nuclear well, might produce a slow d-d fusion reaction, one that takes 10,000 seconds for them to fuse into helium four.<sup>58</sup> This is the kind of exploration activity that is needed, whatever the outcome. Missing from it are the physics departments of MIT, Princeton, Caltech, UC Berkeley, Austin, Harvard, Rochester, and so forth.

Heat is the presenting symptom of nuclear reactions in this field of study. Reviewer 13 tells us, "The only normalizing measurement seems to be heat generation." He continues, "Without the measurement of heat generation I don't think any experiment is going to be convincing. How do you know anything—of low energy nuclear reaction interest such as cold fusion—is going on?"<sup>59</sup> Reviewer 15 also emphasizes this order of procedure, "The question of excess heat is tied up with the production of nuclear products and so one first must be convinced that excess heat is produced."<sup>60</sup> I can recall how astonishing it was in the spring of 1989, to see the hours spent measuring neutron emission from experiments with no assurance they were generating excess heat, not to mention the number of columns in *Nature* devoted to reporting those measurements. It would seem that some Reviewers looked for evidence for nuclear reactions in order that they might better appreciate the evidence for excess heat—they put the cart before the horse.

The physicist, Y. Arata, Osaka University, tells us that it was two years before he mastered the generation of excess heat; Dr. M. Miles, an electrochemist, took six months. Dr. McKubre spent months studying up on calorimetry. CFR requires of the dedicated scientist many months of study to come to the point of appreciating the reality of the calorimetric measurement of the excess heat phenomenon. This emphasis on calorimetry will persist and grow. Future generations of nuclear physicists may have to specialize not only in particle counting, but also in calorimetry.

We hear often that CFR scientists are motivated by the prospect of an endless supply of "clean" fuel. Indeed, that is the motivation for fifty years of hot fusion research, where it is known that deuterium is the fuel. This interest in a clean fuel, however, is not enough for the working scientist to commit a large part of his career to either hot or cold fusion research. It was the firm knowledge of the properties of d-t, and other, fusion reactions, along with a more generalized belief that in twenty years or so a commercial reactor could be realized, that offered intellectual motivation to scientists at the beginning of hot fusion research. The phenomenon of excess heat is the motivating knowledge in CFR.

But how could a scientist be sure that the excess heat energy really existed—that the phenomenon was real—suffi-

ciently to commit his career to it? A few knew by producing it themselves in their laboratory, and by being absolutely certain about the quality of their calorimetry. Some had to study the work of other experimenters. (In the early days, Hagelstein preceded his theoretical talks with the statement, "I believe that excess heat exists.") In either case, about a year is required because of the multi-disciplinary nature of the new science. Those who accept the reality of excess heat find their position to be much like that of Pierre Curie in 1903—they have no knowledge of the energy source. With the conviction that excess heat is a newly discovered natural phenomenon, there is a place for those who find inspiration by working in an entirely new field of science. As Reviewer 8 expressed it, "...we've got the start of a science."<sup>61</sup>

The Review did not emphasize excess heat, but the Report noted that about half the Reviewers found the evidence for "excess power" compelling. If (those who can be identified as) the nuclear physicists are set aside for the moment, two-thirds find the evidence for excess heat compelling. When the Review asked about low-level nuclear reactions (LENR), fully half the Reviewers replied that they recognized evidence for LENR in the papers studied. All Reviewers [except maybe one] called for continuing research support by government funding agencies.

Now, after sixteen years in intellectual isolation, there is regained a chance that the field will be adequately recognized by the scientific community.

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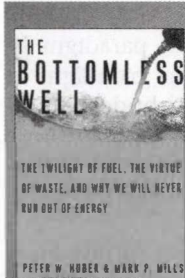
#### About the Author

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# Book Reviews



## **The Bottomless Well:**

**The Twilight of Fuel, the Virtue of Waste, and Why We Will Never Run Out of Energy**

by Peter W. Huber and Mark P. Mills  
ISBN 0-465-03116-1  
\$26.00 Hardcover, 214 pp.  
Basic Books, 2005

Review by William Zebuhr

This book has arrived on the scene at the same time as several other books on the same subject of energy, but it is very different in scope and attitude. The other books discuss the problems of coming to the end of a limited supply of oil and especially cheap oil and generally paint a very gloomy picture of the future with large portions of the population freezing in the dark and sometimes starving as well. The authors of this book start with the same facts and arrive at a very different conclusion. The major difference is that Huber and Mills look at the picture much more broadly and assume with good logic that a large amount of human ingenuity will be injected into the mix and solve the problems that other authors don't confront or assume are not going to be solved. They even have the nerve to use the word *infinite* in relation to energy. There is a chapter titled "Infinite Supply."

Huber is a mechanical engineer and Mills is a physicist and this background shows throughout the book as one problem after another is logically laid to rest or at least the reader is given good reason it will be when the time of crisis is near. The second law of thermodynamics is often cited to explain why so much energy is lost or "wasted" in the transition from raw fuel in the earth to useful energy in the home, factory, or vehicle. There is a certain in-your-face attitude about the way this is presented that is probably meant to drive home the point to some of the environmental and governmental communities but I found it irritating and think, if anything, it weakens their argument. They often mention the "virtue of waste," by which they really mean that when more of this waste is evident, more useful energy is being used with the assumption that it is good for society and a major measure of the advancement of that society. Using more energy is not necessarily good and as society advances many uses of energy should decrease as efficiency increases. They make the case that increased efficiency usually means the device—e.g., a light bulb, car, air conditioner, etc.—will become more popular and the total amount of energy used will increase. This has certainly been the case for many energy-consuming products but this is not likely to extrapolate in the same way in the future.

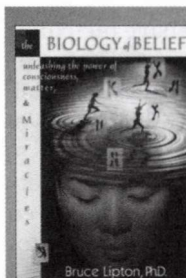
This book presents a broad view of energy including oil, coal, uranium, solar, wind, hydrogen, the electric grid, and even carbohydrate energy. The carbon cycle and climate change are also discussed. Nothing is said, however, about any "new" energy and I get the distinct feeling that it is not taken seriously. They do mention hot fusion and it seems that may be their "infinite" energy. That is a weak point

because, as we know, hot fusion is always 30 years away.

The history of energy is nicely presented and strongly supports their argument that innovation will be the real driving force toward "infinite energy." It is very refreshing, especially for a mechanical engineer, to see the development of the steam engine and other thermodynamic machines discussed by someone who really understands them. Peak oil is not addressed much because it is actually not as important in the big picture as most people think. Its major use now is in transportation and their argument is that eventually most vehicles will be run off the grid via fuel cells and hydrogen or much better batteries. They also express confidence that the supply of oil is much greater than others assume. Their view of oil is the conventional one of it being a fossil fuel. Nothing was mentioned of a possibly even greater supply of hydrocarbons that might have been part of the original formation of the Earth, as was discussed in the last issue of *IE*.

The book offers the most rational discussion of the CO<sub>2</sub> problem and climate change that I have seen. A case is made that the carbon problem is not so serious as is commonly believed, partly because in parts of the world reforestation is absorbing a lot of the carbon. The argument seems to be strong for North America but not for the developing world. The authors argue that as the rest of the world develops, less land will be used for agriculture and some can revert to forest. This may work for awhile but sooner or later population pressure will reverse the trend unless efforts are made to prevent it.

To make their case many facts are presented, often by tables or graphs and sometimes in novel ways. I found the book very readable and informative and recommend it for anyone interested in the broad picture of energy and the environment.



## **The Biology of Belief:**

**Unleashing the Power of Consciousness, Matter, and Miracles**

by Bruce Lipton  
ISBN 0-9759914-7-7  
\$25.00 Hardcover, 224 pp.  
Mountain of Love/Elite Books, 2005

Review by Jon Norris

This is the long-awaited compilation of ideas and research by Bruce Lipton, cell biologist and lecturer in the field of mind/body interaction. Has it been worth the wait? I think so. The book is a wonderful condensation of cutting-edge biology research delivered in simple, readable form. Once I picked it up, I could not put it down until I finished it. After finishing it, I wanted even more. Lipton is engaging and interesting, and it is no wonder his lectures are so well liked.

The book begins with a short overview of how Lipton became interested in science and biology in particular. We glimpse his voyage through academia and the changes he experienced in his career. We are treated to a very clear dis-



cussion of DNA and cell biology that reveals the high quality of Lipton's teaching ability.

Lipton details how he came to the realizations that spawned the book. He reveals his current thinking about how cells operate, and how the mind interacts with cells. His vision is based on research and he includes citations and references. His revelations are also influenced by his incorporation of quantum mechanics into cell biology.

He arrives at the conclusion that DNA is not the primary factor in life processes, and is indeed only a set of fairly passive blueprints called into action by other forces. What other forces? The communications from the membrane of the cell which are the cell's method of understanding and interacting with its environment. They include not only the biochemical palette of allopathic medicine, but also electromagnetic energy from a variety of sources. He paints an interesting picture of the cell and extrapolates that picture to encompass the human organism as a whole. His discussion of the membrane's function is not only enlightening, it is engaging. (And no, I am not a biology geek.) The book is worth reading for his description of cellular functioning alone.

He discusses problems with allopathic medicine, the pharmaceutical industrial complex (love that term), and science in general. His experiences trying to approach mainstream scientists with his revelations mirror the experiences of those in the new energy field.

Regardless of the evidence, many people simply will not accept the death of a paradigm which has outlived its usefulness.

Lipton also touches briefly on the perils of genetic engineering and its emergent problems foreshadowing possible disaster. He discusses the Human Genome Project which has foundered in the wake of conceptual failure and the success of the emerging field of epigenetics. The lesson is that clinging to an outmoded worldview is self-defeating and possibly even fatal. "Grow or die" seems to be a fact of life, and is a "natural law" of greater strength than any postulated by ivory tower scholars.

Fortunately, as Lipton points out, our cells have incredible capacity for life, and hence, so do we. We can "reprogram" life patterns and unleash the immense capabilities in us all. In doing so we are cooperating with the flow of life and evolution, not fighting or trying to dominate it.

Lipton provides us with a concise set of scientific data explaining how therapies such as acupuncture and even placebos might work. While the information cries out for more detail on how to use this knowledge on a daily basis, that is beyond the scope of this book. There is some small concession to this in the Addendum on PSCH-Y, a form of integrative therapy, but that is all. The other quibble I have is minor. I find the analogy on page 198 of cancer to homeless and jobless people to be ill-conceived. I think the analogy would be more accurate if one compared cancer to corporations and damaged cells to homeless and jobless people.

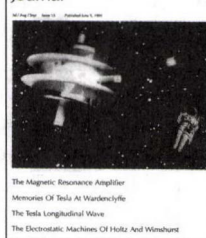
I would like to see Lipton explore other medical "anomalies," such as the medical characteristics of people with Multiple Personality Disorder. I think they hold even more signposts to the true nature of healing than do placebo studies (which by themselves rock the paradigm boat considerably). I would also like to see him include some of the more radical work in physics, such as Sach's unified field work,

Evans' work with O(3) electrodynamics, and Leyton's higher dimensional geometry. Tom Bearden has compiled some impressive research in this area, and the inclusion of these advanced areas of physics into biology would produce truly staggering results.

One thing is certain, the old reductionist paradigm in biology has failed as clearly as has that same paradigm in physics. This book is another foundation piece bridging biology, physics, and healing. It should be of interest to those growing beyond outdated paradigms, or seeking to understand energy-based health practices and the role the mind plays in physical life.

We are on the verge of incredible changes in our most basic views of reality, and this book is a welcome addition to the library of new science. [Jon Norris: jonn@eoni.com]

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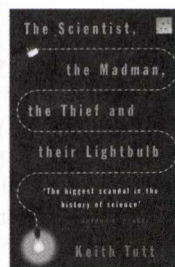
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## The Scientist, the Madman, the Thief, and Their Lightbulb

by Keith Tutt



This is the U.S. release of the book originally titled *The Search for Free Energy*. Tutt presents the many new energy/free energy inventors of the past 100 years, from Nikola Tesla, to Stanley Pons and Martin Fleischmann, to Randell Mills and Alexandra and Paulo Correa; the book includes two chapters on the cold fusion field and its researchers.

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## 2005 Cold Fusion Colloquium at MIT

On May 21, a one-day cold fusion colloquium, "Cold Fusion and Other Clean Energy Investigations from the Edge of the Envelope," was held at MIT, which included a tribute to Eugene Mallove, *Infinite Energy's* founding editor.

Speakers included: Les Case, Scott Chubb, Talbot Chubb, Paulo Correa, John Dash, Hal Fox, Peter Graneau, Peter Hagelstein, David Nagel, Russ George, Mitchell Swartz, and Thomas Valone.

The conference, which was held after *Infinite Energy's* press date for this issue, was organized by Mitchell Swartz and will be covered in full in Issue 62 of *Infinite Energy*.

## Temperature Inside Collapsing Bubble Four Times That of Sun

Using a technique employed by astronomers to determine stellar surface temperatures, chemists at the University of Illinois at Urbana-Champaign have measured the temperature inside a single, acoustically driven collapsing bubble. Their results seem out of this world.

"When bubbles in a liquid get compressed, the insides get hot—very hot," said Ken Suslick, the Marvin T. Schmidt Professor of Chemistry at Illinois and a researcher at the Beckman Institute for Advanced Science and Technology. "Nobody has been able to measure the temperature inside a single collapsing bubble before. The temperature we measured—about 20,000 degrees Kelvin—is four times hotter than the surface of our sun."

This result, reported in the March 3 issue of the journal *Nature* by Suslick and graduate student David Flannigan, already has raised eyebrows. Their work is funded by the National Science Foundation and the Defense Advanced Research Projects Agency.

Sonoluminescence arises from acoustic cavitation—the formation, growth, and implosion of small gas bubbles in a liquid blasted with sound waves above 18,000 cycles per second. The collapse of these bubbles generates intense local heating. By looking at the spectra of light emitted from these hot spots, scientists can determine the temperature in the same manner that astronomers measure the temperatures of stars.

By substituting concentrated sulfuric acid for the water used in previous measurements, Suslick and Flannigan boosted the brilliance of the spectra nearly 3,000 times. The bubble can be seen glowing even in a brightly lit room. This allowed the researchers to measure the otherwise faint emission from a single bubble.

"It is not surprising that the temperature within a single bubble exceeds that found within a bubble trapped in a cloud," Suslick said. "In a cloud, the bubbles interact, so the collapse isn't as efficient as in an isolated bubble."

What is surprising, however, is the extremely high tem-

perature the scientists measured. "At 20,000 degrees Kelvin, this emission originates from the plasma formed by collisions of atoms and molecules with high-energy particles," Suslick said. "And, just as you can't see inside a star, we're only seeing emission from the surface of the optically opaque plasma." Plasmas are the ionized gases formed only at truly high energies.

The core of the collapsing bubble must be even hotter than the surface. In fact, the extreme conditions present during single-bubble compression have been predicted by others to produce neutrons from inertial confinement fusion.

"We used to talk about the bubble forming a hot spot in an otherwise cold liquid," Suslick said. "What we know now is that inside the bubble there is an even hotter spot, and outside of that core we are seeing emission from a plasma."

Press Release: March 2, 2005 ([www.physorg.com/news3229.html](http://www.physorg.com/news3229.html))

## Charles Yost, Editor of *ESJ*, Dies

Charles Yost, the executive editor of the *Electric Spacecraft Journal*, passed away on March 29 after a bout with cancer. Yost is perhaps best known as the NASA engineer who developed Temper (memory) Foam. Plans for a memorial service will be announced later.

The *Electric Spacecraft Journal* is hopeful that it can continue publication and has named Richard Hull the new executive editor.

Visit the journal online at [www.electricspacecraft.com](http://www.electricspacecraft.com).

## Bockris Book Soon to be Released

John O'M. Bockris' new book, *The New Paradigm: A Confrontation Between Physics and the Paranormal Phenomena*, will be released soon.

After retiring from his position as Distinguished Professor of Chemistry at Texas A&M University, Bockris set out to author a book on new science based on a research and teaching history that brought him to numerous breakthroughs and the forefront of cold fusion. *The New Paradigm* represents his observations of the possibility of the impossible.

From the press release: "Just as one would expect a corporation to selectively withhold information to secure revenues, scientists selectively ignore phenomena that threaten their intellectual fiefdoms and research grants. Worse yet, they ridicule colleagues who would attempt to bridge the gap between the known and the unknown. This book attempts to expose and explore these gaps. It shows that the 'paranormal' is simply 'unexplained normal.' It is a directive by a scientist to turn attention to new data which disagrees radically with presently accepted Science. The book challenges the present paradigm and points strongly to the need for a *New Paradigm*."

Bockris has published over 700 peer-reviewed papers and



22 books. He is a founding member of the International Society of Electrochemistry (1949) and the originating author of the Hydrogen Economy. He received the Faraday Medal of the Chemical Society in the UK (1979); the honorary degree of Law from the University of Hokkaido (awarded once every five years) in 1986; and the Volta Medal of the University of Pavia (in Physics) given centennially in 2000.

*Infinite Energy* will review the book and offer it for sale when it is released, which should be in early summer 2005.

## COLD FUSION TIMES

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**Published Quarterly**

Publisher and Editor, Dr. Mitchell Swartz

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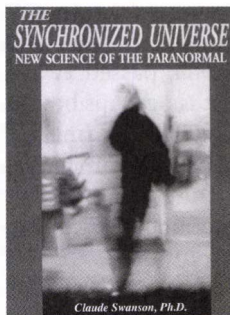
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## The Synchronized Universe:

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by Claude Swanson

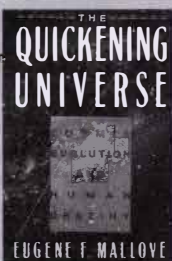
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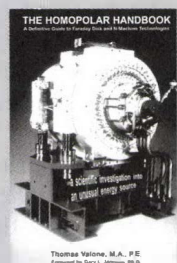
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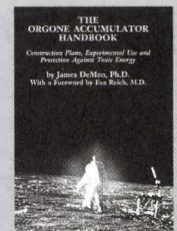
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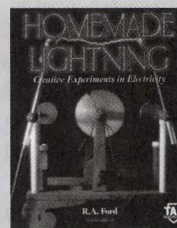


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# Department of Energy Dumps Cold Fusion (Again)

Steven B. Krivit\*

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"I think a review is a waste of time," said Princeton University physicist Will Happer prior to the commencement of the 2004 cold fusion review [*Physics Today*, April 2004, "DOE Warms to Cold Fusion"]. "But if you put together a credible committee, you can try to put the issue to bed for some time."

Perhaps Happer, a member of the original 1989 cold fusion panel and former head of the Department of Energy's Office of Energy Research (now the Office of Science) had greater insight than the cold fusion "believers."

As a quick refresher, here are the conclusions of the 18 peer-reviewers selected by the Department of Energy's Office of Science last year: A) Half of the reviewers found the evidence for excess power compelling. B) Less than one-third of the reviewers believed that the evidence for low-energy nuclear reactions was conclusive.

The bottom line, as stated by the Department of Energy, was that "the conclusions reached by the reviewers today are similar to those found in the 1989 review." The interpretation is that "nothing's new, the claims of cold fusion are still not believable, nor are they worthy of a dedicated research program."

Officially, the Department of Energy claims that it did not slam the door on cold fusion research.

"We have always been receptive to research proposals," Jim Decker, principal deputy director of the Department of Energy's Office of Science, said in an article in the January 2005 edition of *Physics Today* ("Cold Fusion Gets Chilly Encore"). "We make decisions on funding research proposals on the basis of peer review and relevance."

A *New Energy Times* survey performed in late February indicates that U.S. cold fusion researchers fail to sense genuine receptivity from the Department of Energy. Only two researchers report plans to send cold fusion proposals to the Department of Energy. Alternatively, a few researchers indicate that they will submit proposals to the Department of Defense.

Perhaps the clearest indicator of the Department of Energy's true attitude towards cold fusion is seen in the response to Dr. Melvin Miles, a professor of chemistry with the University of La Verne, in southern California.

Miles is considered one of the pioneers of cold fusion research and was the first to identify the relationship between heat production and nuclear products. At the time, Miles was working at the U.S. Navy's China Lake research facility. A few years later, in another major achievement, he collaborated with Ashraf M. Imam, a metallurgist at the Naval Research Laboratory to develop and test a special palladium-boron alloy for use in cold fusion experiments. The alloy resulted in a series of cold fusion experiments that generated excess energy in eight of nine runs and also earned the researchers a U.S. patent. The Patent and Trademark Office doesn't recognize the validity of cold fusion, so the application required careful wording.

"We didn't use the words 'cold fusion'; we just talked about producing heat," Miles said of his 18th U.S. patent.

Miles is a published author of 200 papers, 70 of them in the cold fusion field. A physical chemist, he has been recognized for his excellence in science by a 1966 NATO Postdoctoral Research Fellowship Award, and the following awards from his 24-year tenure with the China Lake Naval Weapons Center: Sigma Xi Award for the Best Scientific Paper in 1985 and 1988, William B. McLean Award in 1987, Fellow Award in 1989.

On January 24, 2005, Miles submitted to Decker a pre-proposal to study cold fusion. The cold fusion field is quite broad; it includes experiments that produce excess energy but no neutrons, and it includes other branches that produce low levels of neutrons but no excess energy. The area of study pertaining to excess energy is, by far, the most controversial, as well as relevant to civilization's future energy needs.

James Horwitz of the Energy Department's Office of Science telephoned Miles on February 17, 2005, with the following bad news:

1. Proposals for the optimization of cold fusion nuclear effects cannot be considered because the 18 Department of Energy panel members concluded that such nuclear effects do not exist.
2. Electrochemical cells have been studied to death, for example, by McKubre at SRI. Proposals of further electrochemical studies likely will not be funded by Department of Energy.
3. Any proposed new experiments need an acceptable theory to justify such further studies.
4. More peer-reviewed journal publications are needed before this field can be considered for funding.

"Because of these points, Jim Horwitz concluded that he cannot justify sending my proposal out for review," Miles commented. "I am really quite shocked at what Jim Horwitz said."

*New Energy Times* asked Horwitz for his side of the story. Horwitz made no corrections to Miles' report. Instead, he offered a one-page explanation of the procedures and criteria for proposals and explained how Miles' proposal fell outside of such criteria.

"The proposed work as stated by Professor Miles is 'to optimize the cold fusion excess power effects by going to higher temperature,'" Horwitz wrote. "As this proposal is aimed at optimization and commercialization of the cold fusion process, I suggested that Professor Miles either restructure the proposed research towards the fundamental science or submit the white paper/formal proposal to one of the applied technology offices within the Department of Energy."

In Miles' proposal, the "Summary of Goals" states the fol-



lowing: "1) Establish the experimental conditions for the production of both reproducible and large excess enthalpy effects. 2) Determine more accurately the correlation between the excess enthalpy and helium-4 as the nuclear product. 3) Investigate possible methods such as fluidized bed reactors and the use of higher temperatures for the commercialization of the excess energy production."

The proposal comprises four pages of text and ten pages of Miles' prior references and publications.

Oddly, the quote allegedly by Horwitz does not appear in Miles' proposal. The word "optimize" does not even appear in Miles' proposal. The sentence does occur, however, in correspondence from Miles after the rejection by Horwitz and after the telephone call.

The alleged quote of Miles by Horwitz and the justification by Horwitz to reject the proposal based on such quote are mistakes by Horwitz at best and a botched cover-up at worst.

Horwitz's candid comments to Miles reveal a rare glimpse into the U.S. government's less-than-visionary behind-the-scenes attitude toward cold fusion.

Here is why: Item 1 from the phone conversation between Horwitz and Miles is contradicted by the Department of Energy's own final report (see the report online at: <http://newenergytimes.com/DOE/DOE-CF-Final-120104.pdf>). Item 2 shows that the Energy Department is still clueless about the heat-generating effect of cold fusion. Item 3 runs counter to the fundamental principle of scientific discovery. Item 4 displays an ignorance of the numerous publications that have appeared in 55 peer-reviewed publications worldwide (<http://newenergytimes.com/Reports/PublishedPapers.htm>).

Miles has his suspicions about Horwitz: "I think he's afraid to fund this area because of the criticism and flak he would get. They are afraid to fund the area so they try to find reasons why not to do it."

Horwitz concluded his letter by stating, "I want to apologize to Professor Miles for any misunderstandings that were generated by my phone call." Perhaps Decker owes Miles an apology for a misunderstanding, too. In this month's *Scientific American*, he was quoted as saying, "We never said we would not fund proposals in cold fusion."

It looks like they just did.

Naturally, Miles is disappointed. "I've been wondering if it's time to retire and forget about cold fusion," he said. "Based on this response, there's no need to keep working on it. I don't see how I'm going to get any funding."

Miles has had a bumpy ride, achieving both successes and failures with cold fusion. The Horwitz response perhaps tops them off. Starting in 1989, Miles, while at China Lake, was unable to see any excess heat effects for the first few months. The Department of Energy had been conducting its first cold fusion review at the time and took notice of his negative findings.

"Apparently, the Department of Energy found my China Lake work to be sufficiently accurate in 1989 to include my results along with MIT and Caltech as evidence against cold fusion in their ERAB report," Miles remembers.

Only a few weeks after the ERAB panel deadline, Miles saw his first evidence of excess heat. He wrote to each one of the panel members, but apparently nobody cared. None replied.

In the mid-1990s, the Navy's Office of Naval Research, under the direction of Bob Nowak, funded a major cold fusion research program, and Miles was included on the

team. During the tail end of that program, Miles and Imam developed and tested their palladium-boron alloy.

"They closed that program just at the time when we were starting to get good results," Miles said. "They had already made the decision to phase it out, so this just came at the wrong time for them. Politically, once they decide not to fund something, they don't like things turning up that will contradict their decision."

The going got rough for Miles after that. A change in administration at the Office of Naval Research resulted in Miles' receiving orders to report to the stock room.

"Richard Carlin, who took over Bob Nowak's job, told people outright that he wouldn't fund me because my reputation was ruined because of my work in cold fusion," Miles said. "Even though I was the only electrochemist there, he funded people all around me at China Lake. He very seldom gave me any money, and if he did, he would fund it and then take it back. They were trying to get rid of people because China Lake was running in the red. So they wrote up a memorandum where I was supposed to report to the stock-room clerk who had a high-school education and help her with an inventory of the chemicals."

A way out of the stock room appeared for Miles in 1997 when the New Energy Development Organization, the equivalent of the Department of Energy in Japan, offered him a six-month job to perform cold fusion research at the New Hydrogen Energy laboratory in Sapporo.

"It was one of the best labs I had worked in," Miles said. He brought one of his palladium-boron alloys to Japan, used it to produce the excess heat effect, and taught the Japanese researchers at the lab how to perform calorimetry.

Will Miles consider foreign research jobs now? "I'm not going to propose outside of the country," he said. "I would like to work in this area, but I don't see much hope."

Miles turned down a job offer from Tsinghua University in China, because he doesn't want to be that far from his family. The administration at the University of La Verne has been very supportive of his interests in performing cold fusion research.

"I could have been released from all teaching duties to work on cold fusion if my proposal had been funded," he said. "I believe that this was my last opportunity to get back to cold fusion research. Because of Jim Horwitz's comments, I see no chance for any cold fusion funding and will now likely retire."

Miles and his wife, Linda Miles, enjoy visiting their cabin in Oregon. "It's like a national forest up there with Douglas firs and ponderosas and a lot of wildlife. I'm planning on bringing up all my cold fusion papers and writing a book," he said.

More on the Miles/Horowitz communication can be found at: <http://lenr-canr.org/acrobat/LENRCANRthedoelies.pdf>.

#### About the Author

Steven B. Krivit is the coauthor of *The Rebirth of Cold Fusion* and the senior editor for *New Energy Times*, a newsletter and website specializing in cold fusion news and educational information (online at [www.newenergytimes.com](http://www.newenergytimes.com)). He is one of the world's leading experts on the field of cold fusion; he regularly communicates with over 70 researchers from 11 nations.

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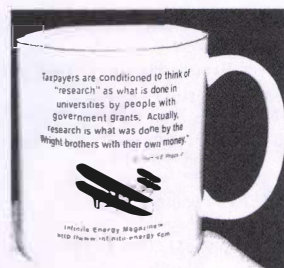
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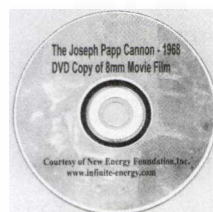
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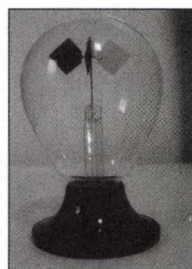
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Patrick G. Bailey\*

*This paper was presented at the INE/EEMF 2001 Symposium for New Energy (Salt Lake City, Utah, October 26-27, 2001) and is published with permission from the author.*

## Abstract

Simple explanations are given as to why we should not believe the power measured from various alternating current devices when using meters to measure the voltage and the current, and obtaining the power by simply multiplying these values. Simple mathematical analyses confirm that power levels calculated with such "AC meter" measurements can vastly over-predict the real power produced in such devices, and that almost any AC device can be tuned-up and shown to be an "over-unity device" or a "free-energy machine" using such simplistic meter measurements and math. For accurate measurements of both input and output power measurements, a high-bandwidth sweep digital oscilloscope is absolutely necessary to calculate the real power levels. The Institute for New Energy (INE) will continue to contact and challenge any such researcher to allow their device to be properly tested, and the results of that challenge and the measurements will continue to be documented in the INE Device Database.

## Introduction

The Institute for New Energy (INE) has been formed to examine, research, and summarize any and all the new and advanced energy conversion devices that any inventor and researcher has to offer. The purpose of the INE is to search for and seek out new forms of potential energy that can be converted into usable power, for either heating or for electricity production.

Any device, if found, that can show that it generates more power in the output than it can in the input is called in the literature an "over-unity device" or a "free-energy machine." Such devices and machines are obviously impossible, as energy cannot be created or destroyed.

However, here is the catch: what if the researcher is not measuring all of the input power; what if some of the input power is stored somewhere as potential energy, and only a small amount of "input energy" is required to somehow convert that potential energy into output energy? If that "inherent potential energy" is not measured in the input power, then the greater output power will cause the device or machine to appear to be an "over-unity device" or a "free-energy machine," when we know that it is really not. In reality, the energy is already there, and is just "ready-to-go."

Examples of such "free-energy machines" abound, such as a flashlight, gunpowder, a firecracker, a bullet, any dam, and any nuclear reactor. The energy that is released is much greater than the energy that we put into it, and it thus can appear to be called a free-energy machine—but we know better.

So it is with other forms of potential energy that we have not yet learned to measure, and thus have not discovered or begun to understand. So any device that could harness any such new potential energy would appear to be a "free-energy machine." Names for some forms of these new undiscov-

ered potential energy sources that researchers have postulated to exist include: Cold Fusion, Low Temperature Nuclear Reactions, Earth Energy, Space Energy, Aether Energy, and Rotational Magnetic Energy. Such devices are being summarized and reviewed in the Institute for New Energy's Device Database.<sup>1</sup> Any device can be entered into this database by completing the device data template for that device.<sup>2</sup>

This paper concerns the measurement of the input and output voltage, current, and power levels of this latter form of postulated potential energy: the potential energy from Rotational Magnetic Energy Devices. The INE website includes many discussions of these other postulated sources of possible potential energy sources.

Rotational Magnetic Energy Devices are those in which coils rotate past magnets, or magnets rotate past coils, in a cyclic manner, to ultimately produce an AC voltage and AC current output. Several devices have been proposed in the literature that are reported to somehow capture some undiscovered potential energy, and thereby achieve an "over-unity" or "free-energy" effect. Some of the devices, most notably, are advertised by Dennis Lee and Better World Technologies.<sup>3</sup>

It is important to realize that the voltage and current measurements made using ordinary electrical measurement meters, such as lab meters or VTVMs (vacuum tube volt meters), will usually not produce an accurate measurement of the actual average voltage and current present over any given cycle. The meters are usually calibrated to measure a RMS (root-mean-square) value of a pure sinusoidal waveform. Thus an average power *cannot* be calculated by just multiplying meter readings of voltage and current unless the waveforms are pure sinusoidal without any phase angle between the voltage and the current. This is explained and shown below. Otherwise, almost anyone can sell you their "free-energy machine" that indeed does *not* work.

Such a simple paper as this is absolutely necessary in the open literature for the average person, or possibly the average investor, as many people have been "taken" by unscrupulous racketeers that promise such over-unity devices, while providing only deceptions and lies.

## Mathematical Preliminaries

The most simple alternating current or voltage waveform (or any waveform for that matter) is a pure sine wave. This is the waveform that you recall from the old TV program "The Outer Limits," and is exactly the waveform that would result on a wall if you glued a pencil perpendicular to the edge of a wheel, and rolled the wheel next to the wall.

The form of a sine wave is mathematically described as, say for a voltage  $V$  (Volts) in an electrical circuit:

$$V(x) = V_o \sin(x)$$



where  $V_0$  is the maximum voltage, and  $x$  varies from 0 degrees to 360 degrees for one complete cycle.

Or, if  $x$  is defined in radians, instead of degrees, then  $x$  would vary from 0 to  $2\pi$  radians for one complete cycle, where  $\pi$  is the universal constant 3.141592653..., and is the ratio of the circumference of a circle to its diameter. So:

$$0 \leq x \leq 360 \text{ Degrees, over } [0, 360], \text{ or equivalently}$$

$$0 \leq x \leq 2\pi \text{ Radians, over } [0, 2\pi].$$

The value of  $\sin(x)$  goes from 0 at the start of the cycle ( $x=0$  degrees), and goes to its maximum of 1.0 at one-quarter of the cycle ( $x=90$  degrees), goes back down to 0 at one-half of the cycle ( $x=180$  degrees), goes to its minimum of 1.0 at three-quarters of the cycle ( $x=270$  degrees), and finally back to 0 at the end of the cycle ( $x=360$  degrees); and continues in this smooth periodic manner for any revolution, or cycle.

Also, the current  $A$  (Amps) in an electrical circuit can also be defined as a sine wave of the form:

$$A(x) = A_0 \sin(x)$$

With maximum current amplitude  $A_0$ .

Given this voltage and this current, then the power (voltage times the current) would be:

$$P(x) = V_0 \sin(x) A_0 \sin(x) = V_0 A_0 [\sin(x)]^2 = P_0 [\sin(x)]^2$$

where  $[\sin(x)]^2$  means  $\sin(x)$  times  $\sin(x)$ , or  $\sin(x)$  squared, and  $P_0 = V_0 A_0$ .

So the maximum power varies from 0 to the maximum power  $P_0$ , which is correctly given as the product as the maximum voltage and the maximum current.

We have no problems with this so far. Now, problems occur because:

1. Most voltage and current waveforms are *not* in phase.
2. Most voltage and current waveforms produced by these rotational machines are not pure sine waves.
3. Rapid voltage or current spikes will give false readings.

### Out of Phase Waveforms

In AC circuits, combinations of resistance, capacitance, and inductance give rise to what is called a "phase angle" that is

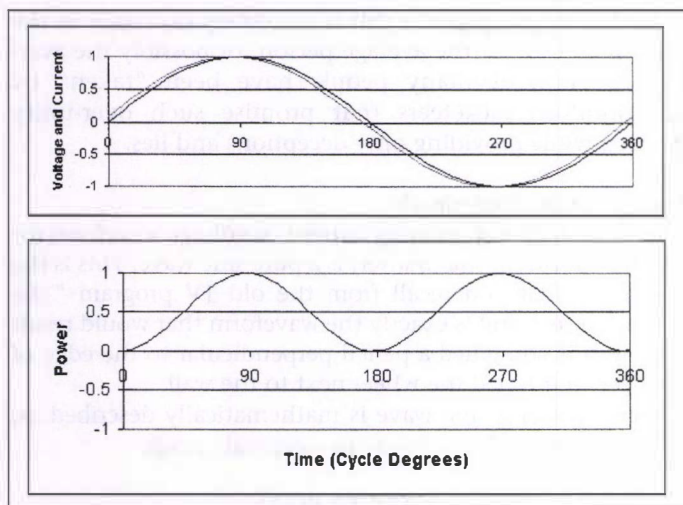


Figure 1. Phase Angle = 5 Degrees. Average Integrated Power = 0.4981.

produced between the voltage and the current waveforms. We shall call this phase angle  $d$ , which is measured like  $x$ , either in degrees or radians. The Phase Angle  $d$ :  $0 \leq d \leq 360$  degrees.

The phase angle measures the difference between the start of the voltage waveform from zero and the start of the current waveform from zero during one cycle. For a zero phase angle, the voltage and current are "in phase," and  $d=0$ . If the voltage rises before the current, then the voltage is said to be "leading," and the current is "lagging," and visa-versa.

The phase angle is calculated as the angle between the pure resistance in a circuit (measured on the  $x$ -axis) and the total reactance of the circuit (measured on the  $y$ -axis, with the capacitive reactance being measured positive, and the inductive reactance being negative—for the voltage lagging the current). These calculations can be found in any electrical engineering book.

We shall assume here that the voltage is lagging the current (as it really does not matter), for some given phase angle  $d$ , and the mathematical equivalent of saying this, for pure sine waves is:

$$V(x) = V_0 \sin(x)$$

$$A(x) = A_0 \sin(x+d)$$

where  $0 \leq x \leq 360$  for one cycle, and  $0 \leq d \leq 180$  for any given phase angle.

With the inclusion of this very real phase angle, the real power becomes:

$$P(x) = P_0 \sin(x) \sin(x+d)$$

where  $P_0 = V_0 A_0$ , as before.

A problem now arises because the maximum voltage occurs at a different time than the maximum current, and separate meter readings will neither account for nor include that!

The effect of this phase angle ( $d$ ) is seen in Figures 1 - 4. These figures show a voltage waveform,  $V(x)=\sin(x)$ , and a current waveform,  $A(x)=\sin(x+d)$ , over one cycle, both with a maximum value of 1.0, and also the calculated power as a function of time,  $P(x)$ . The power also has a possible maximum value of 1.0, when  $d=0$ . The effect of increasing the phase angle from 0, to 5, to 30, and to 60 degrees is seen in these figures, as the current is said to "lead" (or start sooner

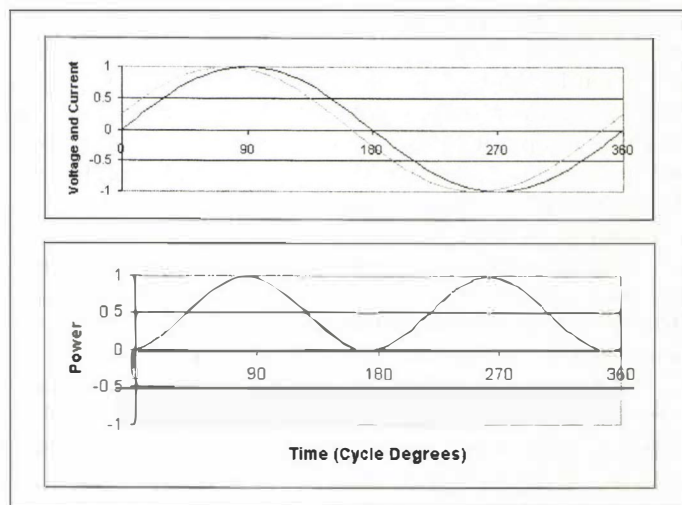


Figure 2. Phase Angle = 15 Degrees. Average Integrated Power = 0.4830.



than) the voltage by the phase angle  $d$ . Although the voltage and current waveforms remain the same, and are just offset (or moved-over) by this phase angle, the shape of the power waveform radically changes, from  $0.5 [\sin(x)]^2$  for  $d=0$ , to more elaborate forms as the phase angle increases. In addition, the power is even seen to become negative when the phase angle becomes just larger than  $d=4$  or  $5$  degrees.

The interpretation of this "negative power" as seen in these figures can be explained as follows. We have arbitrarily defined the direction of the flow of the electrons (or the holes) in a wire to be "positive" in one direction, and "negative" in the opposite direction. So, if the current is positive, the flow is in that "positive" direction. Thus, if the power is negative, the work capable of being performed is just in the opposite direction, due to either a negative voltage or a negative current, and not both. The effect of this "negative power" is considered below.

### Meter Measurements

Meters are usually calibrated so that they measure 0.707 of a sine wave's maximum value. This is called the "RMS" value (root-mean-square value). Here's why:

Let's assume that we want to measure the power in an AC circuit that has the voltage and current as pure sine waves, and in phase. Then, if we measure the voltage and get  $V_m$  (for voltage-measured), and measure the current and get  $A_m$  (for current-measured), then we want the product of those measurements to give us the power measured  $P_m$ :

$$V_m A_m = P_m$$

We also know that the average power for this circuit will be the average of  $P(x)$  above for  $d=0$  (in phase) over one cycle.

Without writing the integral equation, the power should be the integral of  $P(x)$  over one cycle divided by the length of the cycle. The integral of  $\sin(x)^2$  over one cycle is twice the integral of  $[\sin(x)]^2$  over one-half a cycle, and 4 times the integral of  $\sin(x)^2$  over one-fourth of a cycle (due to the symmetry of  $\sin(x)$  squared), each giving the same answer:  $0.5 P_o$ .

So, in order for the meter readings to measure that proper power value, the meter readings must be adjusted (calibrated) to account for that factor, so that:

$$P_m = P_o/2 = 0.5 P_o.$$

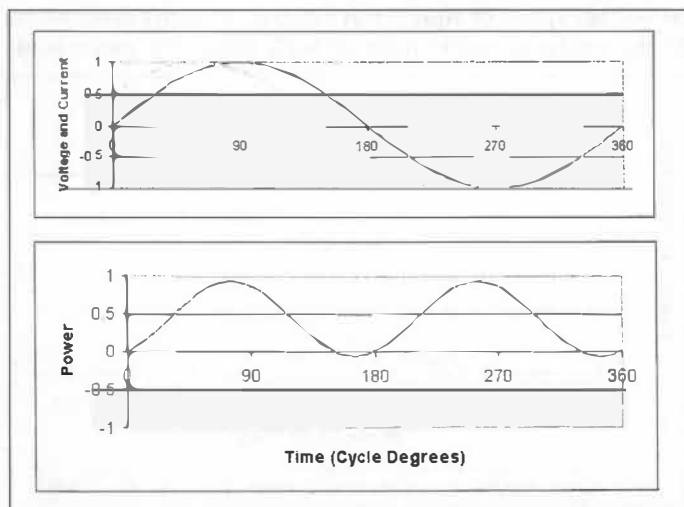


Figure 3. Phase Angle = 30 Degrees. Average Integrated Power = 0.4330.

We will then measure half of the maximum power with the meter, and so we will get the right answer.

To ensure that, the meter must be adjusted or calibrated at the factory to read only  $1/\text{SQRT}(2)$  (or 0.707) of the maximum voltage, or equivalently the maximum current:

$$V_m = V_o/\text{SQRT}(2) = 0.707 V_o$$

and

$$A_m = A_o/\text{SQRT}(2) = 0.707 A_o.$$

In short, by calibrating the meter to read only about 71% of the *peak* value of either the voltage or the current, then the product of these meter readings will give a very close approximation to the actual average power  $P$  for: (1) pure sinusoidal waveforms and (2) *no* voltage-current phase angle.

The meter has now been calibrated.

Now, what happens if we include this real phase angle (that could be anything), or have voltage and current waveforms that are not pure sinusoidal?

In both cases we can get an apparent and *not real* over-unity device.

### Effect of Phase Angle

We can assume the power is represented by pure sine waves to examine the effect of phase angle only, by:

$$P(x) = P_o \sin(x) \sin(x+d)$$

The average power over the course of one cycle would then be:

$$\text{Average Power} = \text{Integral } [P(x) dx] / \text{Integral } [dx]$$

where the integral limits would be from 0 to 360 degrees, or 0 to  $2\pi$  radians.

We know that these indefinite integrals are algebraically equal to:<sup>4-6</sup>

$$\text{Integral } [P(x) dx] = P_o \{ \cos(d) [x/2 - \sin(2x)/4] + \sin(d) [\sin(x) \sin(x) / 2] \}$$

and

$$\text{Integral } [dx] = x$$

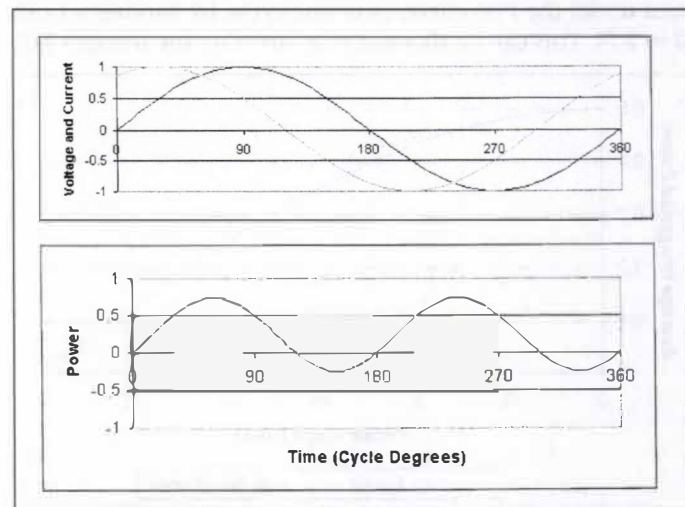


Figure 4. Phase Angle = 60 Degrees. Average Integrated Power = 0.2500.



So, when evaluating this over one cycle, or  $[0, 2\pi]$  radians, we get exactly and analytically:

$$\text{Average Power} = P_o \cos(d) / 2 = P_m \cos(d)$$

So we see that when the voltage and current are in phase ( $d=0$ ), the average power is exactly equal to the measured power; ta da!

But, when the phase angle is not zero, the average power is *less than* the measured power by an amount equal to the cosine of the phase angle. This term,  $\cos(d)$ , is defined as "the power factor" in most textbooks. And, all meter readings must be adjusted by multiplying meter-read calculated power  $P_m$  by this power factor to get the true integrated or average power.

The effect of the phase angle on the integrated power is seen in Figure 5, as calculated by a simple digital FORTRAN computer program. Indeed the integrated power follows the equation:  $P_m \cos(d)$ .

Another way of saying the same thing, is that if you can adjust the resistance, capacitive reactance, and inductive reactance of a device so that you get a big phase angle ( $d$ ) between the voltage and current, and assuming that the voltage and the current are pure sine waves, then the power that you would *seem to get* by multiplying the average meter voltage reading and the average current meter reading would be:

$$\text{Meter Readings Calculated Power} = V_m * A_m = \text{Average Power} / \cos(d)$$

which would always be greater than the real available average power by the amount  $1/\cos(d)$ —which is always greater than 1 for  $d>0$ .

And you might think that this would be an over-unity device, or a free-energy machine!

The effect of forgetting the power factor is seen in Figure 6, where we can plot a "fictitious power gain" that we would get by just multiplying meter readings, when forgetting all about the phase angle and the power factor. It is noted that all we need in our device is enough capacitive or inductive reactance at the device's operating frequency to create a phase angle of about 25 degrees—to get a 10% over-unity device!

#### Effect of "Negative Power" Values

The integration of  $P(x) dx$  above is done by calculating the area under the  $P(x)$  curve, over one cycle, by varying  $x$  from 0 to  $2\pi$ . This can be thought of as dividing the integral  $[0, 2\pi]$

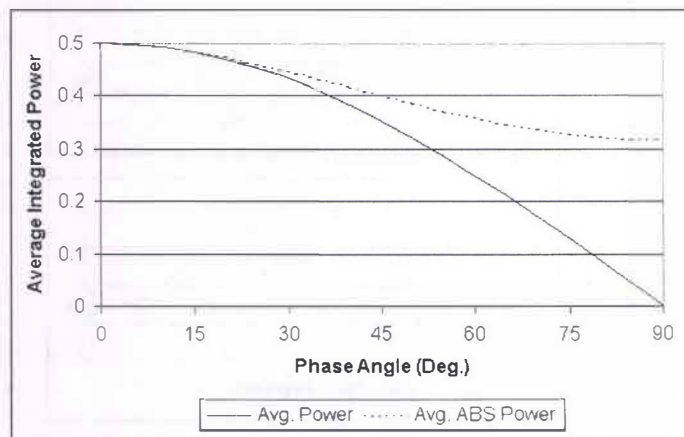


Figure 5. Real Average Power vs. Phase Angle.

$\pi]$  into many divisions, from each  $x(i)$  to  $x(i+1)$ , and calculating the area under  $P(x)$  in that interval, which could be approximated using the trapezoidal rule,  $A(i) = 0.5 [P(i) + P(i+1)] * [x(i+1) - x(i)]$ . Then the whole integral would be the sum of all of these little areas.

This integration process then subtracts any negative power values from the total averaged power during that summation. This is equivalent to saying that the useful work that we can get out of this device, the power times some time interval, is measured with respect to one direction. So, any negative work gets subtracted from positive work.

A device could be built to impose this rule, and also it might not. If a device were constructed just right so that any power created in the opposite direction could also be utilized, then the integrated power should include all negative work as positive work. Mathematically, this is saying that we should integrate not the power values, but the absolute value of the power values (regardless of sign).

If we include all of the power generated over one cycle, regardless of sign, we can sum up the absolute values of all those little areas  $A(i)$  above in a computer program, and plot the real averaged absolute value of the power, the Avg. ABS Power, as seen in Figure 5. Since we are summing more area into the integral, we expect the average power per cycle to be greater than the integrated regular power, as is seen.

Of course if you were advertising a fraudulent "free-energy device," you would not want this Avg. ABS Power to be seen in your results, so you would probably design your device to subtract any negative power. Otherwise, your fictitious energy gain would drop to much lower values, as seen in Figure 6.

#### Effect of Non-Sinusoidal Waveforms

As meters are calibrated for sinusoidal waveforms, to calculate the appropriate RMS values, the use of non-sinusoidal waveforms will give very unpredictable results. The average power will always depend on the shape of the waveform found by multiplying the voltage and current waveforms. Waveforms with slow changes may produce overly-low meter readings, while waveforms with rapid changes may produce overly-high meter readings.

#### Effect of Spiked Voltage or Current Waveforms

In many rotating magnetic devices, it is possible to create very rapidly rising voltage and/or current waveforms, such as voltage spikes or square wave pulses. In many cases when using regular meters to measure such spikes, the meter read-

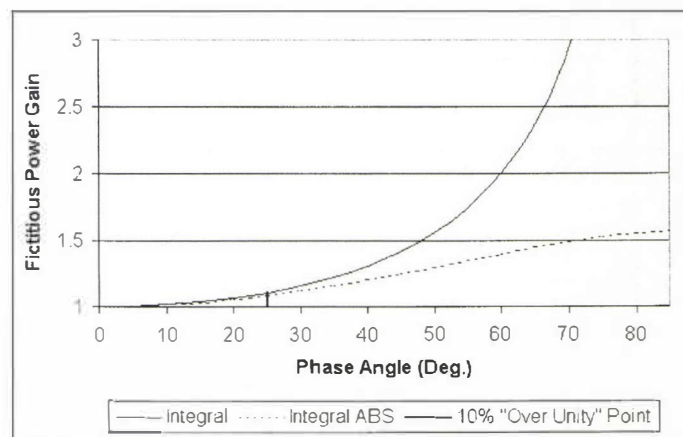


Figure 6. Fictitious Power Increase vs. Phase Angle.



ing will indicate much more voltage or current than is actually present, due to the rapidly increasing signal and the "soft" damping of the needle in the meter. Thus a long series of rapid voltage spikes could cause a meter to read a constant voltage, even though the actual applied voltage is not constant. In this manner a series of voltage spikes and a series of current spikes could cause the average voltage and average current meter readings to appear to be constant, thus appearing to give a constant power when multiplied together, when in actuality the real power could be very small, and even zero if the voltage and current spikes are out-of-phase.

### Lighting Lamps to Measure Power

Some people think that if a 100 Watt light bulb can be lit, then there must be 100 Watts flowing in that circuit. This is absolutely *not true!* Just as meter readings can produce false data, so can glowing light bulbs! It can be shown that light bulbs can be illuminated with only a fraction of the electrical power associated with the bulb, by using various pulsed waveforms and either high voltage or high current pulse widths. Again, in these cases, the voltage and current must be digitally measured as a function of time, and the power digitally calculated from those waveforms, to determine the real average power in the circuit.

### Recent Investigations [2001]

Recently, the "free-energy generator" advertised and promoted by Lou Brits and John Christie, located in Cairns, Australia, gained a lot of attention in the U.S. and abroad.<sup>7</sup> The INE is in contact with a research team that traveled to that city with their own equipment to test that device in the latter part of 2001. Unfortunately, the claims made about this device were found to be false, and its efficiency very high, and not over unity.

### The One Watt Challenge

At one of the first Institute for New Energy international conferences, Harold Puthoff submitted a paper entitled the "One Watt Challenge" to be given to any over-unity device researcher; which basically says: "Close the loop and show me you can produce 1 extra Watt of power"—or shut up. This open challenge still stands for all rotating magnetic and AC frequency devices.<sup>8</sup>

### Conclusions

We *cannot* use separate voltage and current meter readings to obtain an average power value in complex AC circuits. These circuits are found in all rotational magnetic devices, generators, and machines.

We *must instead* use a high sample rate, high bandwidth digital oscilloscope to measure the time-dependent voltage and current waveforms, and to then digitally calculate the power waveform. The average power is then to be calculated from that power waveform over each cycle. If work in both circuit directions can somehow be used in the device, then the absolute value of the power is to be averaged over each cycle.

The only way you can see what the real power is in any circuit in complex AC devices is to:

1. Measure the voltage waveform digitally with a high frequency oscilloscope, and store it over a cycle or multiples of cycles;

2. Measure the current waveform digitally and store it over a cycle or multiples of cycles;

3. Calculate the digital power waveform by digitally multiplying the digital voltage and current waveforms, and

4. Average the power waveform over one cycle, or multiple complete cycles, digitally and carefully.

This can all be easily done with today's high-bandwidth, multi-channel sweep digital oscilloscopes.

The INE will be more than happy to recommend to any researcher the name and address of an independent test engineer who would love to analyze your favorite "free-energy machine" in this manner!

Almost all of the so-called "over-unity devices" and "free-energy machines" that you will find advertised in the U.S. and even internationally will be *false*, because of the facts explained here in this paper.

The INE will continue to track all of the devices and machines that it is aware of, and show any short-comings of each.

The INE will continue to contact all researchers that claim to have such electricity generating machines, and to offer our known research engineers to test and calibrate their device or machine.

All results and ignored requests will be documented and posted on our INE Device Database website.

The INE is continuing to look for the new devices and machines that *will* really work, as new forms of potential energy are continually being discovered and understood.

Remember: Anytime anyone wants to show you their "over-unity device" or their "free-energy machine" where they are using AC meters to measure the input and out powers, by measuring separate voltage and current readings and then just multiplying them together to get a power reading—run, do not walk, to the door!

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# Radioactive Decay of Po-210 and Co-60 at Two U.S. Observation Stations in the Path of the Umbra/Penumbra of the Total Eclipse of the Sun of December 4, 2002 in Southern Australia

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## Abstract

This report documents the predicting and measuring of a dip in the radioactive decay of Po-210 and Co-60 at observation stations respectively in Massachusetts and Kansas, USA, associated with the nearby passage of the path of the umbra/penumbra of the total solar eclipse in southern Australia of December 4, 2002. These stations are located in regions of the Earth's surface on the opposite end of the Earth's diameter from where the eclipse was total in southern Australia. The anomaly is attributed to the interruption by the Earth and moon of external particles (emanating from the Sun) that would otherwise impinge upon the nuclei of the source isotopes at the detecting stations, and if so could have stimulated or influenced radioactive decay. This effect may then parallel our measurement of the gravitational anomalous dip associated with the planetary syzygy of May 18, 2001.

## Introduction and Background

Our continuous theoretical and experimental research on gravity, modeled through external particle collision with nucleons, coupled with our efforts to develop a more fundamental physics which emphasizes net momenta transfer<sup>1</sup> of particles, instead of conventional notions of "force" and "field," led us to study the correlating of further phenomena conventionally associated with fundamental forces, with instead external particle impingement. We were specifically led to explore unconventional relationships between cosmophysical events and radioactive decay because of our earlier work on the origin of gravity that had revealed an anomaly signature on the total gravitational field measured locally at the Earth's surface during the Earth-Sun-Jupiter-Saturn syzygy event of May 18, 2001, which is not predicted by a Newtonian or General Relativity theory of gravity. Since during the course of our gravity research we became aware of the five decades of work by Shnol' *et al.*<sup>2-4</sup> reporting daily, monthly, and yearly patterns in the recurrence of histograms (of a given shape) in the radioactive decay of Pu-239 which the authors tentatively associated as related in *general* to cosmophysical events, we then decided to study whether correlations existed between radioactive decay and well-understood *specific* cosmogonic events. We elected to analyze the decay of the isotope, Po-210, because of access to the Rad-7 solid-state instrument, utilized worldwide to detect the presence of radon gas (Rn-222) and capable of detecting the radioactive decay of the daughter isotopes of radon (which include the Po isotopes). Since we had been successful in predicting and measuring an actual dip in gravity<sup>5</sup> associated with the syzygy, based on a collision-induced external particle gravity model,<sup>6,7</sup> we hypothesized that astrophysical events may cause a dip in radioactive decay rate that would

be measured at a local station.

Radioactive decay is conventionally associated with what has been referred to as "the weak force." The term "weak" is used because the subject binding force is weak, then radioactive decay via alpha or beta particles, or gamma radiation, can be spontaneous.<sup>8</sup> Therefore we undertook specifically a study of radioactivity during a total solar eclipse as the cosmogonic event when the weak force is less perturbed, and planned to compare our results with data taken (or planned to be taken) during a Full Moon, a New Moon, a planet-quasar syzygy, and a lunar eclipse.

## Apparatus, Procedure, and Preliminary Experiments

We elected to measure the alpha particle decay of Po-210 because of its ideal half life of 140 days, realizing that in order to observe the triggering of counts from a fixed source there must be no discernible change to the source during the lifetime of the experiment. Therefore, the Rad-7 was operated in isolation with the outlet connected to the inlet so that no radon was entering the chamber, and the counts were summed every four hour period (one count represents one alpha particle, or doubly ionized helium nucleus). We also recorded the decay of the other polonium isotopes, as well as summing the total counts per interval of live time because the latter provides for enhanced counting statistics.<sup>9</sup>

Our preliminary study searching for anomalies in radioactive decay that may be associated with a cosmogonic event (such as a Full Moon or New Moon) was conducted at the Farlow Herbarium at Harvard University during the period of August-September 2001. We hypothesized that during the New Moon, the moon may affect (diffract, deflect, or modify) solar-emitted muon neutrinos and cause a decrease in impingement on the target and a consequent decrease in radioactivity (at thus a local observation station). Alternatively, during the Full Moon there may be a similar transient blockage of muon neutrinos that originated from deep space as well as the blockage by the Earth of solar generated muon neutrinos, possibly creating a time interval of decrease in radioactivity, again at a local station. In this experiment we were not employing histograms but instead analyzing only direct measurements from raw data in number of counts per four hour live time. It is clear that under the above hypothesis, the total radioactive decay signature of the behavior of these events would have a very complex form when including also the twelve hour period before and after the actual Full or New Moon. We were aware of correlation between radon gas concentration (from data taken in a former gypsum mine in Luxembourg) and the Earth's tides<sup>10</sup> (lunar declination period of 25.8 h, and principal lunar period of 12.4 h), but since we employed a closed sys-



tem, cosmogonic effects that affected gravity would not introduce freshly released radon into the Rad-7 detector.

Our data on the decay of Po-210, taken in August-September 2001, are given in Figure 1a. These data marginally revealed a pattern of peaks and troughs periodic over ~12 h and ~25 h, but the two-sigma magnitude was borderline in the Poisson statistics (Chapman analysis). However, the data very clearly showed a peak in radioactivity that was in excess of two-sigma, occurring on August 26 for the recording live time of 1200-1600 hrs EDT. We tentatively correlate this peak in Po-210 decay counts (and in total decay counts) with the deep space supernovae explosion event designated as SN 2001dz in UGC 47, and photographed by T. Boles and G.M. Hurst in Basingstoke, England, on August 27-28, 2001.<sup>11</sup> It is well known that a supernovae event releases a very significant flux of neutrinos.

By plotting total counts for the four hour period from 11:00 a.m. through 3:00 p.m. EDT (Po-210, Po-212, Po-214, Po-216) we noted a change in the general pattern corresponding to the Full Moon period of September 2-4 and the New Moon of September 16-18. (See Figure 1b.) Subsequent analysis of earlier and later data of others taken during the Full Moon and New Moon intervals showed similar anomalies; however, much more work must be conducted to establish a correlation in the raw radioactivity data measurements and these events to parallel conclusions akin to those gleaned from the five decades of histogram data of Shnol' *et al.*<sup>2-4</sup>

We next made a direct alpha particle decay study during the eclipsing by Jupiter of the deep space quasar J0842+1835 during the period September 7-9, 2002, again using the Rad-

7 instrument.<sup>12</sup>

Our Po-210 alpha particle decay data during the period of September 7-11, 2002, were reported in Reference 5, and had indicated somewhat broad troughs of a relatively square signature at 6:00 a.m. - 10:00 a.m. on September 7, 8, and 9, thus periodic in one-turn of the Earth on its axis as expected in the lengthy eclipsing event.

#### The Total Solar Eclipse of December 4, 2002

Figure 2 gives the path of the locations where the solar eclipse of December 4, 2002, could be observed as total, commencing in the South Atlantic Ocean, and then traversing Angola, Zambia, Namibia, Botswana, Zimbabwe, South Africa, and Mozambique between 0555 and 0630 UT, then crossing the southern Indian Ocean, and then passing into southern Australia and terminating in eastern Australia (at 143 degrees East longitude, and 29 degrees South latitude). The eclipse was total over the south Australian coastal town of Ceduna, where the Sun was totally blocked by the moon for 31 seconds, located at 132 degrees East longitude, and 32 degrees South latitude. We realized that even though we were unable to make radioactivity measurements at locations where the eclipse was total, we could indeed make use of the fact that laboratories of colleagues in the United States were approximately on the *opposite* end of the diameter of the Earth from south Australia where the solar eclipse was calculated to be total, thus in or near the umbra and/or penumbra of the eclipse. These laboratories include where the Rad-7 instrument is built and tested at Durrige Corporation,<sup>9</sup> under the leadership of Dr. Derek Lane-Smith,

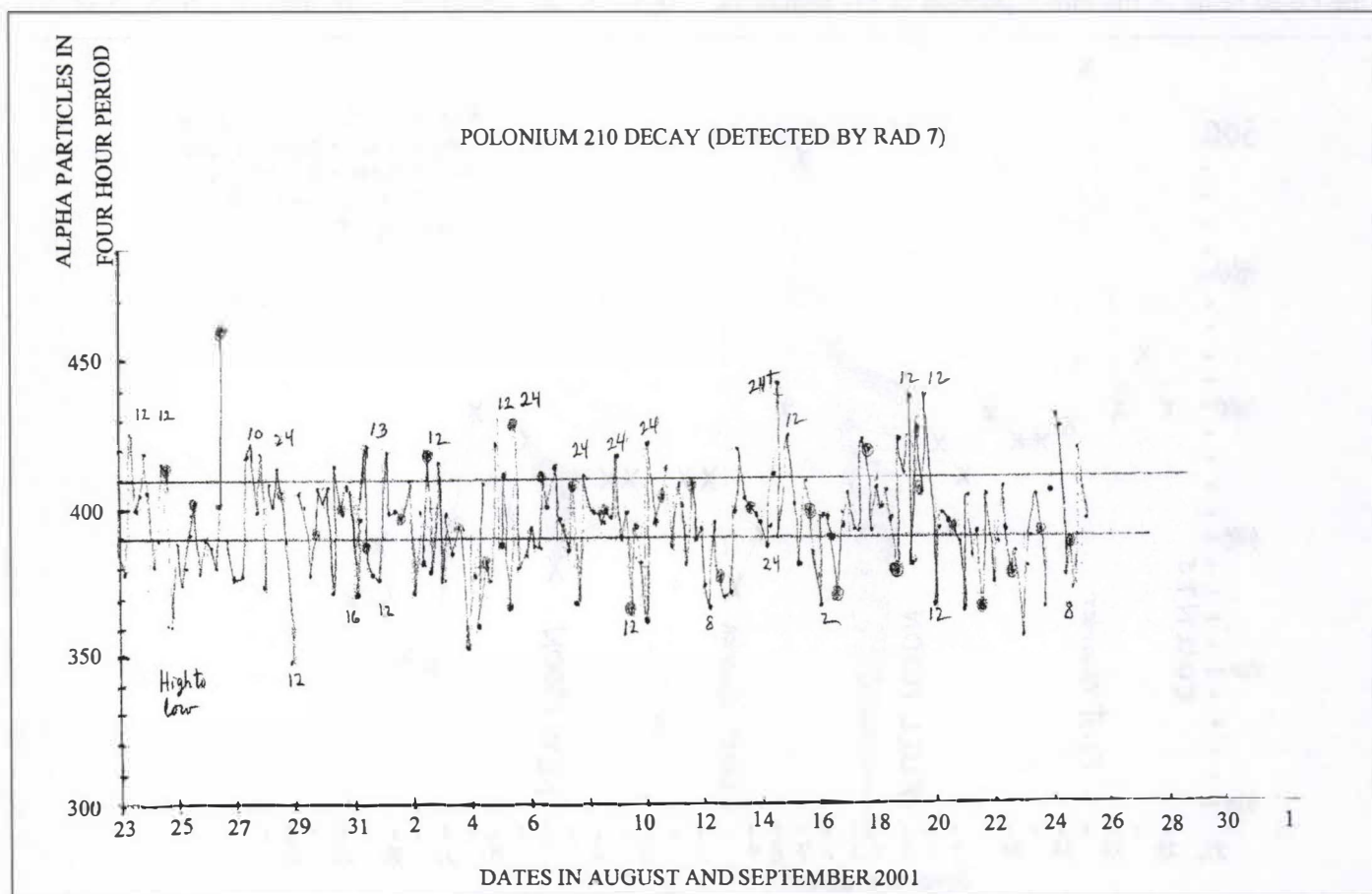


Figure 1a. Po-210 decay in alpha particles per four hour period of live-time for period of late August through late September 2001 showing peak on August 26 for 11:00 a.m. through 3:00 p.m. time interval and suggestive of a possible diurnal pattern.

located in Bedford, Massachusetts (longitude 70 degrees West; latitude 42 degrees North; about 12 miles NE of Boston) and at Pittsburg State University, in southeast Kansas (latitude 37.4 degrees North, longitude 94.7 degrees West), where Professor C. Blatchley<sup>13</sup> offered to conduct measurements of the gamma radiation decay of a Co-60 source. Our hypothesis was that along the approximate Earth's diameter from south Australia to the region of the two stations in the United States, when the umbra of the eclipse passed closest, it should be expected that the respective instruments will record a dip in the radioactive alpha particle decay rate of Po-210 and in the gamma decay rate of the Co-60 sources, relative to background. *This would be expected because the maximum mass available for absorption or modification of external particles would be associated with a column of material in the vicinity of a diameter of the Earth plus in the vicinity of the diameter of the moon.* Therefore, there would be a higher overall probability that a muon neutrino emitted from the Sun would be absorbed.

Figure 3 gives the data for radioactive decay (in counts per period of live time) for the Po-210 source<sup>9</sup> and the Co-60 source<sup>13</sup> and shows a minimum or dip signal in the decay rate of each source at about the time when the umbra passed closest to the source/detection station. The upper trace shows the Co-60 decay data in counts per minute referring to the left-hand ordinate scale. The time scale is plotted on the lower abscissa in Central Standard Time (CST). After 10:00 p.m. on December 3, the live time is 15 minutes (counts are summed every 15 minutes) in these data. The eclipse came closest to the Co-60 source at 2:21 a.m. CST (the Co-60 being in the mirror position of the penumbra,

but not the umbra) on December 4, and the lowest counts per minute was recorded for the 15 minute period ending 3:05 a.m. CST. The lower trace in Figure 3 shows the Po-210 data, using a live time of one hour, and showing a minimum reading (right-hand ordinate) for the period ending approximately 6:00 a.m. EST. The eclipse passed closest to the Po-210 source at about 5:30 a.m. EST (upper time scale). Although the magnitudes of the signals (dips) are not pronounced, two independent recording stations, well over 1,000 miles apart, respond with decreased radioactivity counts when the umbra/penumbra of the eclipse passed closest to the detecting stations. Thus, under the condition of the total solar eclipse, the distance that particles travel along the approximate line of centers from the surface of the Earth where the eclipse was total to the detection stations, plus the distance along the diameter of the moon, is a maximum. This extreme in distance that particles traverse is associated with a maximum number of nucleons that the external particle can encounter, offering then the highest probability for the absorbing or modification of a muon neutrino or other external particle emanating from the Sun.

#### Discussion, Interpretations, and Conclusions of Radioactivity Data Taken During the Total Solar Eclipse

The local gravitational anomalous dip<sup>5</sup> reported to be associated with the syzygy of Earth-Sun-Jupiter-Saturn of May 18, 2001, and the radioactivity anomalous dip associated with the total solar eclipse of December 4, 2002 are both considered subtle energy effects that can be expected to be of a magnitude of no more than 0.01 - 0.05 % variation, and therefore are admittedly very difficult effects to observe

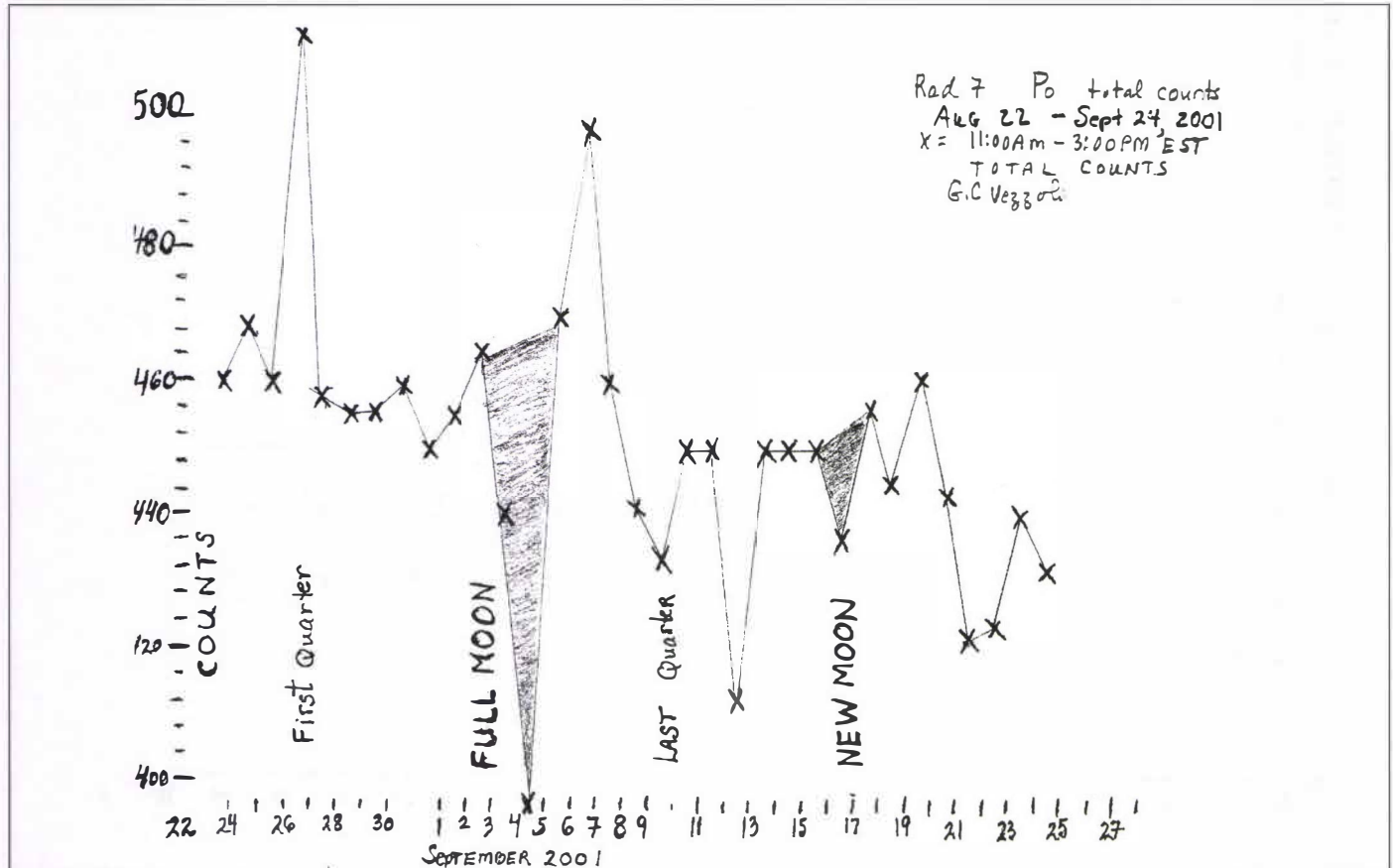


Figure 1b. Po total counts during 11:00 a.m. - 3:00 p.m. EDT showing irregular behavior during Full Moon and New Moon time intervals. (The time interval was selected because of the expected significance of the Sun as a source of muon neutrinos.)



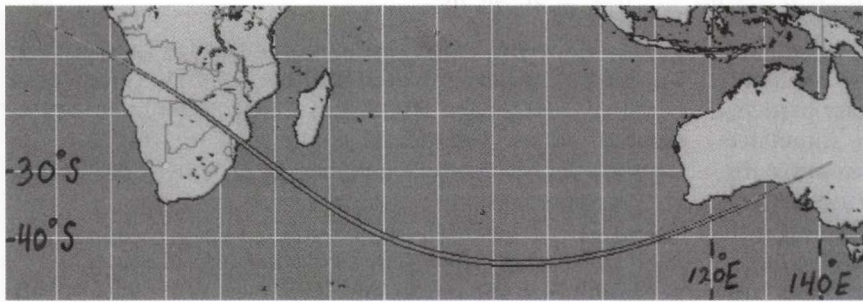


Figure 2. The path of the total solar eclipse of December 4, 2002.

experimentally, and separate from background. However, coupled with supporting data from our measurements of August-September 2001 during Full Moon, New Moon, supernova explosion periods, and our data associated with the Jupiter-Quasar eclipse interval,<sup>5</sup> and considering the parallel theoretical development in the understanding of external particle impingement,<sup>6</sup> we believe the radioactivity decay rate dips during the total solar eclipse of December 4, 2002 are real phenomena, and should at the least motivate additional work.

Some months after conducting our total solar eclipse measurements we received private communications from Professor Shnol' and co-workers giving data on unique histogram patterns taken at widely separated detecting/recording stations (including at sea) at the time of a New Moon. These communications emphasized the similarities between the New Moon and the total solar eclipse in that in both cases the moon acts to affect some particles that emanate from the Sun. We also note similarities in the recent Shnol' New Moon data and our own total solar eclipse data. We were more recently informed by Shnol' and co-workers that

their equipment was adapted with collimators, and experiments then showed far stronger repeat histogram patterns when the collimator was oriented to the west than when the collimator was oriented to the north (polar star), indicating the significance of directionality, supporting our viewpoint of the significance of directionality and *local* measurements of anomalous behavior. In addition, the Po-210 count was recorded by Dr. Lane-Smith during the period of the total lunar eclipse of November 8, 2003 (8:04 p.m. EST), and showed a minimum value at 12 hours previous of

totality, a time when both the moon and the Earth interrupt particles from deep space, and a maximum about 16 hours after the eclipse when the recording lab is oriented toward the Sun. This type of complex behavior is indicative of the expected complex signature of the event as affecting elementary particle incidence upon the radioactive source/detector.

Since the anomalous dip in both alpha particle decay at the observation station in the Boston area, and the anomalous dip in gamma radiation decay at the observation station in Kansas, were both *predicted* and *observed* to occur when the umbra/penumbra of the total solar eclipse in southern Australia passed closest to the respective station, we conclude that the postulate that *external particles, particularly muon neutrinos, affect radioactive decay*, should be considered feasible and should be further explored by careful and sophisticated experiments such as during the upcoming annular hybrid eclipse expected on April 8, 2005, rising south of New Zealand, and becoming total over Panama and Columbia. We currently interpret the dips in radioactive

Rad-7 data (X, lower) using polonium-210 by Derek Lane-Smith of Durrig Corporation, Bedford, MA. Cobalt-60 data (O, upper) by Professor C. Blatchley of Pittsburgh State University, Kansas. All data taken during December 4, 2002 total eclipse of the sun during the umbra/penumbra (eclipse was total at the time in Southeastern Australia). These dips were predicted by Dr. G.C. Vezzoli from interpretations and inferences from the collision induced gravity model.

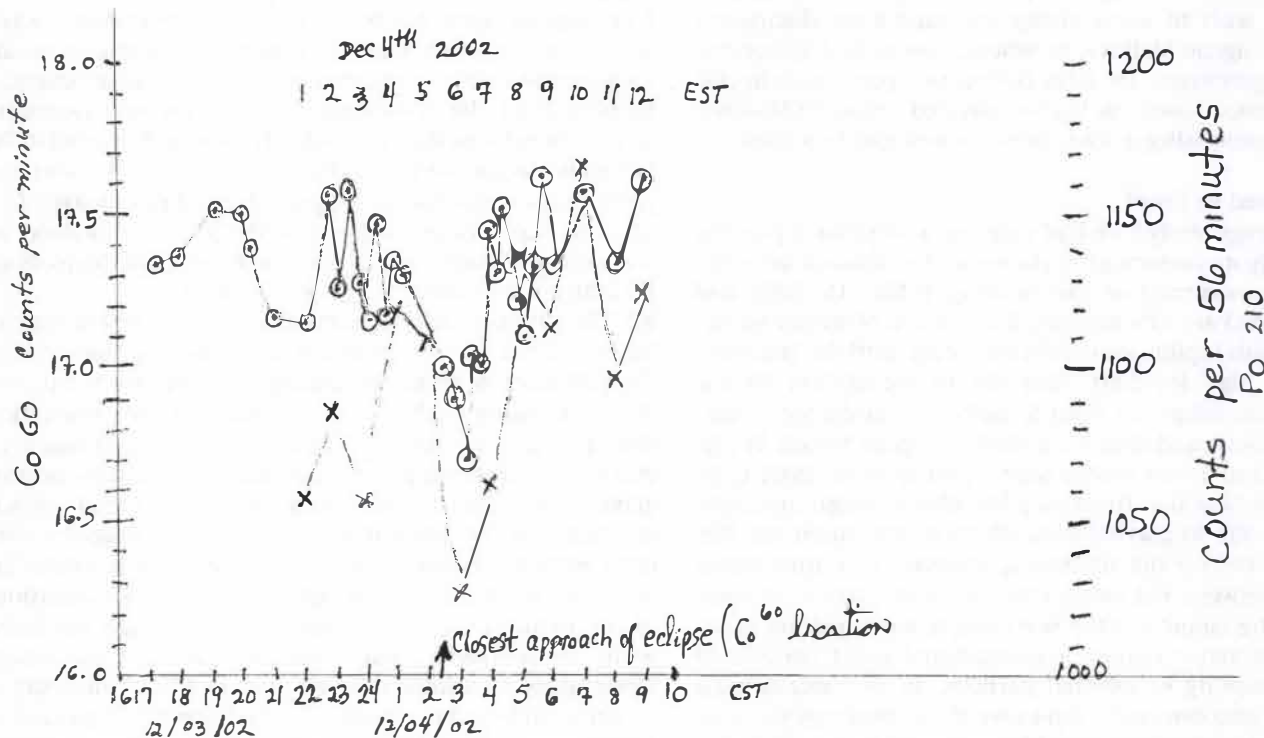


Figure 3. Po-210 and Co-60 radioactive decay during the umbra/penumbra of the total solar eclipse of December 4, 2002. See References 9 and 13, and text.

decay of Po-210 and Co-60 to be a result of absorption and/or scattering by the Earth and moon (along a diameter, or columnar region surrounding diameters of the Earth and moon) of muon neutrinos and/or other elementary particles emitted by the Sun, that would otherwise have stimulated radioactive decay in the target sources by overcoming the "weak force." This overcoming of the weak force interactions is expected to be a consequence of particles colliding with Po-210 and Co-60 nuclei and consequent transfer of linear and total momentum. Since the muon neutrino is the only showering particle of the three neutrinos (or three "flavors" of the neutrino), and is associated with an appropriate energy range ( $m < 170$  keV), we postulate that the muon neutrino influences radioactive decay.<sup>14</sup> We infer its collision cross-section to be  $10^{-37}$  cm<sup>2</sup>.

### Acknowledgments

The author wishes to express much gratitude to Dr. Derek Lane-Smith of Durrige Corporation for leasing a Rad-7 instrument to the author and for dedicating Rad-7 instruments to measure radioactivity decay of polonium during the total solar eclipse of December 4, 2004, and during the Jupiter-Quasar eclipse of September 7-9, 2002, and for very valuable discussions. Also equal gratitude is expressed to Prof. Chuck Blatchley of Pittsburg State University for dedicating the Co-60 source for measurements during the December 4 eclipse, and also for many fruitful discussions. The author also wishes to express appreciation to collaborator, theoretical physicist Dr. William Stanley of Parametrics Technology Corporation in Needham, Massachusetts, for very valuable discussions, and to collaborator Frank Lucatelli who contributed much analysis relating to the building blocks of matter through elementary particle collective design geometry. In addition, the author extends appreciation to Professor Donald Pfeister and his staff at Harvard University for providing laboratory space and computer support for the Rad-7 August-September 2001 measurements. Finally, I wish to acknowledge the supportive discussions with Dr. Eugene Mallove, to whom, also with collaborator, physicist-physician, Dr. John Gedy, this paper is dedicated in memoriam. Gratitude is also extended to Sandra Smalling for word processing, e-transmissions, and graphics work.

### Note Added in Proof

In our syzygy study,<sup>5</sup> we had detected a cusp-like dip in the twice-daily measurement of the mass of a standard laboratory weight, occurring on the morning of May 15, 2001, and were puzzled as to its meaning because the planetary syzygy of Earth-Sun-Jupiter-Saturn did not occur until the late afternoon on May 18, 2001. Recently, in preparation for the hybrid solar eclipse of April 8, 2005, we conducted similar measurements and detected a similar cusp on March 31 and April 13, and a very similar scatter plot as in the 2001 data. We now believe that these cusp-like dips in weight measurement are due to gravitational effects of the moon and the Sun that yield a net minimum anomaly at a time about halfway between full moon and new moon, when the locations of the moon and the Sun cause a combined net maximum subtractive opposing gravitational effect because of the interrupting of external particles. In this recent mass study, we also detected a dip-in-weight anomaly at the time of the solar eclipse and New Moon of April 8.

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8. See for example, *Physics For Scientists and Engineers*, 3rd ed., Vol. 2 by Paul Tipler, Worth Publishers, New York, 1991.
9. See the Durrige Corporation website for the description of the Rad-7 solid-state detector: [www.durrige.com/Rad7](http://www.durrige.com/Rad7), and private communications from Dr. Derek Lane-Smith, Director, Durrige Corporation. The Rad-7 instrument is equally sensitive to particles from all directions.
10. Kies, A., Majerus, J, and D'Orey de Lantremange, N. 1999. *Nuovo Cimento*, 22, C, 3-4. The radon concentration data correlation with the Earth's tides is explained in terms of the increase in vertical extension and the decrease in gravity, induced by Earth tides in the bulk of the rocks through which the radon gas percolates, and the opening of supplementary pathways for radon to flow through rock crevices, thereby increasing radon transport through the rocks of the mine. In our own work/measurements of any cosmogonic-induced anomalies in radioactivity, however, the influence of the moon is hypothesized in terms of blocking or modifying some externally originating particles that would otherwise impinge upon a detector at a local observation coordinate. [On the other hand, a supernovae explosion would increase the source of external particles (especially neutrinos forming from the combination of protons and electrons), some of which can then alternatively transfer momenta to the polonium target isotopes in the Rad-7 detector chamber and possibly then stimulate or trigger enhanced radioactivity.]
11. The supernovae, designated SN 2001 is described at: [www.theastronomer.org/supernovae.html](http://www.theastronomer.org/supernovae.html). Code symbols are SN 2001dw\_20010825\_tb.jpg or SN 2001dz
12. The very precise astronomical knowledge of the orbit of Jupiter allows for the possibility of measuring the speed of the propagation of gravity during the eclipsing event, and then comparing to the speed of light. Our own theoretical model of gravity, being based on a "push-phenomenon," due to omnidirectional external particles (collision-induced gravity; see Reference 6) insists that the external particle propagates at the speed of light otherwise the drag phenomenon would de-stabilize planetary orbits. After reducing the data from the Jupiter-quasar eclipsing event, the conclusions of the preprint work of Fonalont and Kopeikin (affiliated with, respectively, The National Radio Astronomy Observatory, Charlottesville, Virginia, and The University of Virginia) endorsed the prediction that gravity propagates at a speed very comparable to that of light, thus not contra-



dicting tenets of our model of gravity which, if contradicted, may have altered the interpretation of the radioactivity measurements.

13. C. Blatchley, Pittsburg State University, private communications. Professor Blatchley accumulated several days worth of raw spectra, consisting of billions of events binned into 256 channels, and analyzed in several different ways, requiring about 10 hours of computation. In each data point, the elapsed time was 900 seconds, the actual "run time" when the detector was active was about 868-869 seconds. Total counts accumulated under the peak in each interval was about 15,000. The calculated one sigma variation (including both signal and background) was about 0.4. The average for the complete data set was 17.07 cps, but the average for the subset of data during the interval of the eclipse was 17.30 cps. The Co-60 source was in the penumbra of the eclipse long before and after the time of closest approach. The apparatus has slightly more sensitivity in the east-west direction, however, is basically an omnidirectional system regarding the absorption of neutrinos. Professor Blatchley has indicated that one of the low points in the data just before the closest approach of the umbra could be considered outside one sigma, however, he has asked the author to make mention that at the time of the writing of this paper, he has not endorsed the author's interpretation of the data, and awaits the accumulation of more data on subsequent total solar eclipse events before casting an interpretation.

14. Recent work has shown a decrease in the lifetime of Be-7 when placed in the center of carbon 60 (buckyball). [See: Ohtsuki, O. *et al.* 2004. *Phys. Rev. Lett.*, September 10.] This is presumably due to a "smearing out" of quantum mechanical wave functions because of proximity, and a consequent intensifying of the collision and electron-capture phenomena causing decreased lifetime. This effect can be described as a time-independent perturbation of the electron cloud over-

lap (hybridization). The transient change (decrease) in impinging particle flux density incident upon the nucleus of an atom (due to cosmogonic phenomena) can also be viewed as a perturbation (but time-dependent). Conservation of total momenta considerations indicate that the nucleus must respond to the changing impulse, and some particles in a shallow potential well should tend to remain in that well, particles which would otherwise be given enough energy to be excited out of the well or tunnel through a barrier and be ejected radioactively if occulting or syzygy did not occur.

#### About the Author

Dr. Gary Christopher Vezzoli received his B.S. in physics from Fordham University, M.S. in geophysics from Boston College, and Ph.D. in solid-state science from Pennsylvania State University. As a research physicist and university professor he has authored over one hundred papers published in scientific journals of physics and chemistry. Recently, Dr. Vezzoli has turned his attention to biophysics and the life sciences. In 1998, while teaching physics and chemistry, Dr. Vezzoli was awarded the research project Mentor of the Year Award in the state of Massachusetts. He is currently working on experimental studies of the effect of high g on fragmentation of DNA and on the cell structure of DNA, and also on interfering with a retrovirus' property of injecting its DNA into a host cell.

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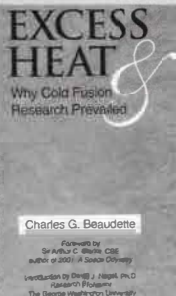
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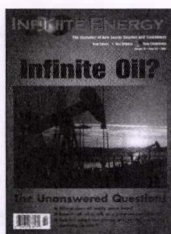
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